7.0 PLANNED DECOMMISSIONING ACTIVITIES

PURPOSE OF THIS SECTION

The purpose of this section is to describe the Phase 1 decommissioning activities.

INFORMATION IN THIS SECTION

This section provides the following information:

- In Section 7.1, a brief summary of site conditions expected at the beginning of the Phase 1 decommissioning activities;
- In Section 7.2, a summary of the general approach and the general requirements that apply to the decommissioning activities;
- In Sections 7.3 through 7.10, descriptions of the Phase 1 decommissioning activities;
- In Section 7.11, a summary of the types of remediation and demolition technologies to be employed; and
- In Section 7.12, a discussion of the conceptual project schedule.

RELATIONSHIP TO OTHER PLAN SECTIONS

To put into perspective the information in this section, one must consider the information in Section 1 on the project background and those facilities and areas within the scope of the plan, Section 2 on facility operating history, and Section 3 that describes the facilities at the WVDP. One should also consider the radiological status information presented in Section 4.

The activities described here would be accomplished in accordance with requirements in other sections, as follows:

- Section 1.6, project management and project organization,
- Section 1.7, radiation safety and monitoring of workers;
- Section 1.8, environmental monitoring and control;
- Section 1.9, radioactive waste management;
- Section 8, quality assurance for engineering design, data, and calculations; for characterization; for engineered barrier installation; and for final status surveys; and
- Section 9, characterization surveys, in-process surveys, and final status surveys.

7.1 Conditions at the Beginning of the Phase 1 Decommissioning Work

Section 1.10 of this plan describes the interim end state to be reached at the conclusion of WVDP facility deactivation work. Section 4 summarizes the radiological conditions of facilities and areas within the scope of this plan. Table 7-1 notes the expected conditions in each facility or area in the interim end state, i.e., at the beginning of the Phase 1 proposed decommissioning work, based on information provided in Section 2 and Section 4. This table does not address soil and groundwater except in WMA 1 and WMA 2 where large areas would be excavated.

Table 7-1. Facility and Area Conditions at the Beginning of Phase 1[1]

WMA	Facility/Area	Conditions (See legend at table's end for acronyms)
1	Process Building	Partially decontaminated, high radiation levels in some cells, vitrified HLW canisters in the HLW Interim Storage Facility, CSRF removed.
	Vitrification Facility	Partially decontaminated, high radiation levels in Vitrification Cell.
	01-14 Building	Significant contamination in filters, portion of off-gas line in building[2].
	Vitrification off-gas line	Significant residual radioactivity.
	Utility Room	No contamination above MDC in most areas.
	Utility Room Expansion	No contamination above MDC in most areas.
	Load-In/Load-Out Facility	No contamination above MDC in most areas.
	Plant Office Building	No contamination above MDC.
	Fire Pump House	Not impacted by radioactivity.
	Water Storage Tank	Not impacted by radioactivity.
	Electrical Substation	Not impacted by radioactivity.
	Underground tanks	Significant contamination in Tank 7D-13, little in others.
	Underground lines	Significant contamination in some lines, especially 7P120-3.
	Subsurface soil, groundwater	Significant contamination in plume source area under the Process Building
	Surface soil	Low-level contamination may be present in several areas.
2	Lagoon 1	Deactivated, significant radioactivity in sediment.
	Lagoon 2	In use, radioactive water, significant radioactivity in sediment.
	Lagoon 3	In use, radioactive water, low levels of radioactivity in sediment.
	Lagoon 4	In use, radioactive water, low levels of radioactivity in sediment.
	Lagoon 5	In use, radioactive water, low levels of radioactivity in sediment.
	Interceptors	In use, significant contamination in Old Interceptor, less in new ones.
	Neutralization Pit	In use, low-level contamination.
	LLW2 Building	In use, low level contamination, radioactive water in sump.
2	Underground lines	Most in use, low-level contamination.
	Solvent Dike	Low-level contamination in soil.
	Subsurface soil, groundwater	Contaminated with Sr-90 in plume area, other subsurface soil contamination.

Table 7-1. Facility and Area Conditions at the Beginning of Phase 1[(1)]

WMA	Facility/Area	Conditions (See legend at table's end for acronyms)
	Surface soil	Low-level contamination in much of area.
3	Tank 8D-1[(3)]	Laid up, one HLW transfer pump and five mobilization pumps in place.
	Tank 8D-2[(3)]	Laid up, one HLW transfer pump and four mobilization pumps in place.
	Tank 8D-3[(3)]	Laid up, one submersible pump in place.
	Tank 8D-4[(3)]	Laid up, one submersible pump in place.
	Con-Ed Building	Low levels of residual radioactivity, mostly inside equipment.
	Equipment Shelter	Low levels of residual radioactivity, mostly inside equipment.
	HLW transfer trench	High levels of residual radioactivity inside piping and equipment.
4	Construction and Demolition Debris Landfill	Low level Sr-90 contamination from the north plateau groundwater plume in some buried waste and in other parts of WMA 4. [WMA 4 and the landfill are not within the Phase 1 proposed decommissioning scope.]
5	Lag Storage Addition 4, Depot	No contamination above MDC.
	RHWF	Low levels of contamination, but may be significant in Work Cell.
6	Sewage Treatment Plant	Not impacted by radioactivity.
	South WTF Test Tower	Not impacted by radioactivity.
	Demineralizer sludge ponds	Low levels of radioactivity in soil.
	Equalization basin	Not impacted by radioactivity.
	Equalization tank	Not impacted by radioactivity.
7	NRC-Licensed Disposal Area (NDA)	Significant radioactivity in buried waste, low-level surface soil contamination. [The NDA is not within the Phase 1 proposed decommissioning scope.]
9	Drum Cell	No contamination above MDC.
10	New Warehouse	Not impacted by radioactivity.

NOTES: (1) See also Table 2-12 in Section 2, which contains information on the radiological status of remaining concrete floor slabs and foundations.
(2) The filters may be removed before Phase 1 begins.
(3) These tanks contain significant amounts of residual radioactivity and the mobilization and transfer pumps are expected to have high radiation levels as indicated in Section 4.1.

LEGEND: CSRF = Contact Size Reduction Facility (former Master-Slave Manipulator Repair Shop)
MDC = minimum detectable concentration
RHWF = Remote-Handled Waste Facility
WTF = Waste Tank Farm

7.2 General Approach and General Requirements

7.2.1 General Approach

As explained in Section 1, it is proposed that the WVDP decommissioning be accomplished in two phases. The following activities would take place in Phase 1.

Facility and Equipment Removal

The following facilities and equipment would be removed:

- All WMA 1 facilities, including the three underground wastewater tanks and the underground lines;
- In WMA 2, the five lagoons, the Interceptors, the Neutralization Pit, the LLW2 Building, the Solvent Dike, the Maintenance Shop leach field, the remaining concrete slabs and foundations, and the underground wastewater lines within the large excavation;
- In WMA 3, the waste tank mobilization and transfer pumps, the Con-Ed Building, the Equipment Shelter and condensers, and the piping and equipment in the HLW transfer trench;
- In WMA 5, the two remaining structures – Lag Storage Addition 4 and the Remote-Handled Waste Facility – and the remaining concrete floor slabs and foundations;
- In WMA 6, the Sewage Treatment Plant, the south Waste Tank Farm Test Tower, the two demineralizer sludge ponds, the equalization basin, the equalization tank, and the remaining concrete floor slabs and foundations;
- In WMA 7, the remaining gravel pads associated with the NDA hardstand;
- In WMA 9, the Integrated Radwaste Treatment System Drum Cell, the sub-contractor maintenance area, and the trench soil container area; and
- In WMA 10, the New Warehouse.

The following facilities and equipment on the project premises are not within the scope of the Phase 1 proposed decommissioning activities:

- In WMA 2, the North Plateau Pump and Treat System, the Pilot Scale Permeable Treatment Wall, the Full-Scale Permeable Treatment Wall, and underground lines not within the excavated areas;
- In WMA 3, the four underground waste tanks, the Permanent Ventilation System Building, the Supernatant Treatment System Support Building, the HLW transfer trench itself, and the underground lines;
- In WMA 4, the Construction and Demolition Debris Landfill and the new Permeable Reactive Barrier;
- In WMA 6, the rail spur;
- In WMA 7, the NDA and the associated interceptor trench; and
- In WMA 10, the Meteorological Tower and the Security Gatehouse.

Approach

Soil and sediment on the project premises would be characterized for radioactivity. Before the Process Building is removed, the new Canister Interim Storage Facility would be built on the south plateau, the Load-In Facility converted to a Load-Out Facility, and vitrified HLW canisters transported to the new Canister Interim Storage Facility.

One large excavation would be dug to remove the WMA 1 facilities and a second large excavation dug to remove key WMA 2 facilities. These excavations would extend down into the underlying Lavery till. Contaminated surface and subsurface soil in these excavations would be removed to achieve derived concentration guideline levels (DCGLs) for unrestricted release specified in Section 5[1]. The source area of the north plateau groundwater plume in WMA 1 would be removed, but not the non-source area portion of the plume, except for those portions that fall within the large WMA 1 and WMA 2 excavations.

Activity Integration

The work would be sequenced for maximum efficiency. For example, the Low-Level Waste Treatment Facility would be kept in service until the Process Building is taken down so its wastewater treatment capabilities can be utilized during the Process Building decontamination and demolition work. The conceptual schedule in Figure 7-15 describes the general sequence. Section 1.6 describes the more-detailed schedules that would be used in management of the project.

More details would appear in one or more Decommissioning Work Plans, which would be completed before the Phase 1 proposed decommissioning activities begin and would address matters such as demolition of the Process Building and the Vitrification Facility.

7.2.2 General Requirements

The following general requirements would be adhered to during proposed decommissioning activities described in Sections 7.3 through 7.10.

Use of Approved Written Procedures

Following DOE policy, the proposed decommissioning activities would be accomplished in accordance with written procedures formally approved by the appropriate member(s) of the decommissioning team.

Remedial Technologies

The decommissioning contractor would utilize efficient, proven technologies in accomplishment of the work. Section 7.11 provides examples of these technologies. DOE has generally avoided being prescriptive in methods to be used to give the decommissioning contractor the flexibility to make use of improved methods that may become available. Exceptions include the conceptual designs for engineered barriers, which are more specifically described because of their importance in support of Phase 2 of the proposed decommissioning. The Decommissioning Work Plan(s) would provide more-detailed information on remedial technologies to be used.

Dealing With Unique Remediation Issues

Given the complexities of the site, some remediation issues would be faced during Phase 1 of the proposed WVDP decommissioning that are highly unusual, if not entirely unique. Two such issues are demolition of the Process Building and removal of the

[1] As explained in Section 5, cleanup goals have been established below the DCGLs for unrestricted release to account for combined exposure scenarios that could potentially be encountered if the entire project premises were to be cleaned up to unrestricted release standards in Phase 2 of the decommissioning. Where the term *DCGLs* is used in this section, it refers to the cleanup goals specified in Section 5. The surface soil cleanup goals would be applied from the ground surface to a depth of three feet; below that depth the subsurface soil cleanup goals would apply.

radioactive contamination in the source area of the north plateau groundwater plume that extends far below the building.

The Process Building is an unusually complex structure, much of which is built of heavily-reinforced concrete. Some cells and the spent fuel handling and storage areas extend far below the ground as explained in Section 3. Despite extensive decontamination efforts over a lengthy period, significant amounts of residual radioactivity and high radiation levels will remain in some parts of the structure at the beginning of the Phase 1 proposed decommissioning work as indicated in Tables 4-7 and 4-8 of Section 4. Equipment containing significant amounts of radioactive contamination will also remain in some areas, such as the Liquid Waste Cell.

The process to be followed in demolition of the Process Building is outlined in Sections 7.3.3 and 7.3.8 below. To assist the decommissioning contractor with demolition of the building, DOE is having a Decommissioning Work Plan prepared. This work plan, which would provide implementing details for the requirements in this plan, is being prepared by DOE's current WVDP contractor to take advantage of that contractor's experience with deactivation and partial decontamination of various parts of the building. Experience with demolition of large contaminated buildings at other DOE sites is also being considered in development of this work plan.

Remediation of the source area of the north plateau groundwater plume is being carefully planned. The process to be followed is outlined in Section 7.3.8. Conceptual engineering work performed in support of the Decommissioning EIS has been considered in design of the excavation. The excavation design makes use of an unusually thick (13 feet) vertical hydraulic barrier on the downgradient side to facilitate removal of as much contaminated soil as practical in that area. DOE has considered deep soil remediation experience at other DOE and commercial sites in developing plans to deal with this unusual remediation issue.

Mitigative Measures

Actions would be taken as necessary to eliminate or reduce potential impacts to human health and the environment during the proposed decommissioning work and to prevent recontamination of remediated areas. For example, the excavations for WMA 1 and WMA 2 would be planned to minimize the impacts associated with handling of removed contaminated soil, such as protecting laydown areas with a suitable covering material. Fixatives and water spray would be used as necessary to minimize airborne radioactivity during demolition of contaminated structures and equipment. Suitable covering material would be placed over removed contaminated soil and other loose radioactive waste to prevent the spread of contamination.

Confinement structures also would be used or other radiological control measures taken to minimize the release of airborne radioactivity associated with removal of soil containing significant concentrations of radioactivity. Appropriate dust suppression measures would be taken also during demolition of noncontaminated concrete and steel and during transportation of waste generated in such work.

Mitigative measures would include as low as reasonably achievable (ALARA) considerations, such as removal of contaminated soil to concentrations below the cleanup goals in cases where this would be practical. Details would be provided in the Decommissioning Work Plan(s) or in a separate Mitigative Measures Plan.

Radiological Controls

Radiological controls and personnel monitoring during proposed decommissioning activities would be in accordance with the DOE radiological control procedures identified in Section 1.7.

Worker Safety

DOE would follow its internal requirements discussed in Section 1.7 and all other applicable requirements to ensure worker safety during the proposed decommissioning work. These requirements would be detailed in a project Health and Safety Plan.

Waste Management

Radioactive waste generated during proposed decommissioning activities would be managed in accordance with DOE procedures identified in Section 1.9, characterized, and disposed of offsite at appropriate government-owned or commercial disposal facilities. Hazardous and toxic waste would be managed and disposed of offsite in accordance with applicable requirements. Non-radioactive equipment and demolition debris would be disposed of offsite at a construction and demolition debris landfill.

Quality Assurance

The quality assurance requirements of Section 8 would be adhered to during engineering analysis and design, compilation of engineering data, characterization, and the Phase 1 final status surveys. Applicable DOE quality assurance requirements would be implemented in other proposed decommissioning activities.

Conceptual and Detailed Designs

This plan describes the processes to be utilized during remediation activities in general terms and designs for engineered barriers and supporting facilities in a conceptual fashion. Detailed procedures for the remediation processes would later be developed consistent with the DOE policy stated above. Likewise, more detailed designs would later be developed for engineered barriers and other engineered features of the proposed decommissioning.

Characterization

As indicated in Section 4, the WVDP facilities and areas had not been completely characterized for radioactivity as of 2008. Additional characterization would be performed as necessary in accordance with the Characterization Sample and Analysis Plan, as explained in Section 9. The soil and sediment characterization would include the portions of the streambeds of Erdman Brook and Franks Creek located on the project premises[2].

[2] It is not intended that the characterization extend outside of the project premises, even in cases where environmental media contamination has been previously identified outside of the project premises, i.e., in the cesium prong area to the northwest of the project premises and in stream sediment in Franks Creek downstream of the project premises.

Some specific cases where additional characterization surveys and sampling would be necessary are identified in this section.

Characterization of subsurface soil in the area of the large WMA 1 and WMA 2 excavations would include collecting samples in the top portion of the Lavery till. Samples of subsurface soil would also be collected along the upgradient and cross-gradient edges of the excavation footprint in WMA 1 and on the edges of the WMA 2 excavation footprint. Analytical data from these samples (1) would help determine the best location for the excavation boundaries, (2) may be useful in refining the conceptual model used in developing subsurface soil DCGLs as described in Section 5, and (3) would support planning Phase 1 final status surveys to be performed on the sides of the excavations.

Characterization measurements would include those necessary for waste management purposes. The decommissioning contractor would provide a procedure for characterizing materials for waste management purposes and obtain DOE approval of this procedure. This procedure would be consistent with applicable DOE requirements and guidance, as well as any applicable State-specified waste acceptance criteria for radioactivity in the offsite landfill(s) where uncontaminated material may be disposed of. This procedure would apply to, among other materials, surface and subsurface soil not known to have been impacted by radioactivity.

Note that the specific proposed decommissioning activities described below are based on assumptions about conditions that will be encountered during the course of the work. If characterization were to disclose unexpected conditions, the proposed decommissioning activities would be changed as necessary to ensure that conditions at the conclusion of the Phase 1 proposed decommissioning activities meet the DCGLs (i.e., the cleanup goals). This plan would be revised as appropriate under these circumstances with NRC involvement as described in Section 1.13.

DCGLs and Cleanup Goals

DCGLs for surface soil, subsurface soil, and stream sediment referred to in this section are the cleanup goals specified in Section 5. The DCGLs for Sr-90 and Cs-137 are based on a 30-year decay period, as discussed previously.

ALARA Analyses

The results of the preliminary ALARA analysis are described in Section 6. As specified in Section 6, additional ALARA analyses would be performed during the WMA 1 and WMA 2 excavations using in-process survey data. These analyses would determine whether remediation to residual radioactivity concentrations below the cleanup goals would be cost-effective. If this is determined to be the case, then additional subsurface soil would be removed as indicated by the results of the analyses.

In-Process Radiological Surveys

In-process surveys would be performed in connection with the proposed decommissioning activities for radiation protection and waste management purposes in accordance with the requirements of Section 9.

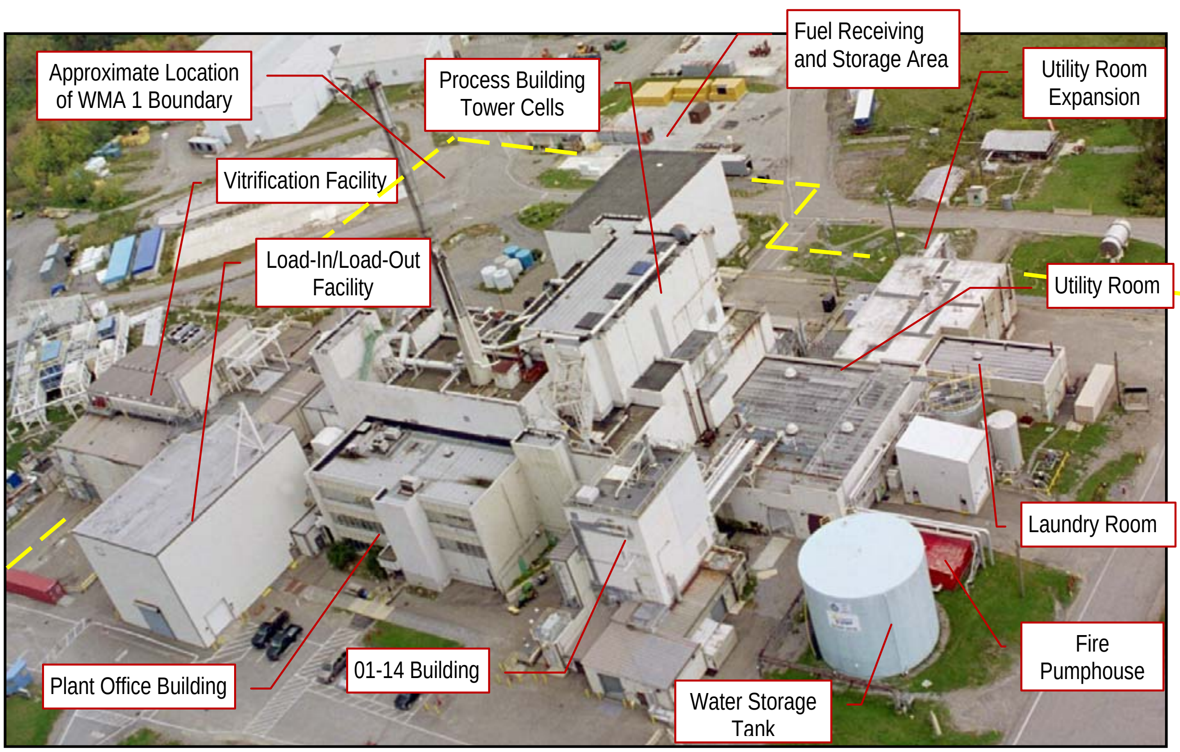
Final Status Surveys and Confirmatory Surveys

Phase 1 final status surveys would be accomplished in accordance with the Final Status Survey Plan as explained in Section 9 of this plan, which would also address confirmatory surveys to be performed by NRC or its contractor. When Phase 1 final status surveys are specified below, inherent in the survey process would be any additional remediation necessary to achieve the cleanup criteria and resurveys of areas remediated to ensure that the criteria were achieved.[3]

The Phase 1 final status surveys focus on areas to be made inaccessible by proposed decommissioning activities. Phase 1 final status surveys would be performed and confirmatory surveys coordinated with NRC or its contractor before these areas are made inaccessible. An example of such an area would be the lagoon excavation in WMA 2, which would be filled with earth only after the Phase 1 final status surveys and confirmatory surveys have been accomplished and the resulting data reviewed and accepted.

7.3 WMA 1 Proposed Decommissioning Activities

This section describes the proposed decommissioning activities in WMA 1, the Process Building and Vitrification Facility area, to be accomplished in Phase 1. Figure 7-1 shows WMA 1.



7-1. WMA 1 in 2007

[3] Section 9 uses the term *Phase 1 final status surveys* to describe these surveys of excavations, which would follow the final status survey protocols of the *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)* (NRC 2000).

7.3.1 Characterizing Soil and Streambed Sediment

Soil and sediment in WMA 1 would be characterized for residual radioactivity in accordance with the Characterization Sample and Analysis Plan described in Section 9. The results of this effort would be used in planning the excavation work described below.

7.3.2 Relocating the Vitrified HLW Canisters

The 275 vitrified HLW canisters would be relocated to the new Canister Interim Storage Facility to permit demolition of the Process Building.

General Approach

The new Canister Interim Storage Facility (if the approach is selected by DOE) would be set up on the south plateau. The Equipment Decontamination Room would be modified to support handling the vitrified HLW canisters and the Load-In Facility would be converted to a Load-Out Facility. The vitrified HLW canisters would then be moved from the HLW Interim Storage Facility (the former Chemical Process Cell) and loaded into shielded dry storage canisters. Each storage canister would be placed in a shielded onsite transport cask and moved by truck to the new Canister Interim Storage Facility. The storage canisters would be maintained there in protective storage until they can be transported to the federal geologic repository.

This approach is among several approaches described in a preliminary conceptual engineering study (WVNSCO and Scientech 2000) which is currently under evaluation by DOE. If this approach is selected by DOE, detailed designs based on the preliminary conceptual designs would be developed. These designs would take into account the size of the canisters (two feet in diameter by 10 feet long), their weight (approximately 5,000 pounds each), their high radiation levels (about 1,750 to 7,500 R/h when they were moved into the HLW Interim Storage Facility in the former Chemical Process Cell), and the amounts of radioactivity they contain (an average of approximately 37,000 curies each in 2005) (WVNSCO 2006)[4]. The DOE is expected to make a decision on the preferred approach in the near future. A shielded dry interim storage system similar to those used at nuclear power plants for spent nuclear fuel is assumed for purposes of this plan.

Procurement of Interim Storage System for the Vitrified HLW Canisters

The interim storage system would include 69 shielded canisters and shielded modules made of reinforced concrete in which to store these shielded canisters. Each shielded canister would be capable of (1) holding four vitrified HLW canisters, (2) being loaded in a horizontal position, (3) being transported onsite within a shielded transport cask by truck, and (4) being transported within a shielded transport cask to the geologic repository by rail. The shielded canisters would be used for both onsite storage within the reinforced concrete storage modules and transport within a shielded transport cask.

The onsite shielded transport cask would be capable of (1) holding a single shielded canister, (2) loading and discharging the shielded canister in a horizontal position, and (3)

[4] Table 2-10 in Section 2 shows the activity estimate for a typical HLW canister.

being positioned on the onsite transport trailer so the open end can be partially inserted into a shielded area during both loading and discharge.

NOTE

The conceptual designs described below for the modifications to the Equipment Decontamination Room and the Load-In Facility and for the new Canister Interim Storage Facility for the vitrified HLW canisters depend on the characteristics described above. If DOE were to use an interim storage system with different characteristics, this plan would be revised to reflect the appropriate changes.

Modifications to the Equipment Decontamination Room

These modifications would involve setting up the Equipment Decontamination Room to remotely handle the vitrified HLW canisters and prepare them for insertion into the shielded canisters. The vitrified HLW canisters would be moved into the Equipment Decontamination Room from the HLW Interim Storage Facility using the existing transfer cart, which holds four canisters in a vertical position, or in a similar conveyance. New equipment would be installed to remove the canisters from the transfer cart, lower them into a horizontal position, and move them into a shielded transfer cell constructed in the Load-In/Load-Out Facility.

Conversion of the Load-In Facility

The shielded transfer cell would be constructed at the east wall of the facility between the shield door to the Equipment Decontamination Room and the air lock. This cell would be designed for operators to remotely perform the following activities: (1) verify canister dimensions as necessary, (2) weigh the canisters, (3) measure gamma radiation levels and removable surface radioactivity, (4) decontaminate the outside surfaces of the canisters, (5) load them in the shielded storage canisters, (6) weld the storage canister lids in place, and (7) load the shielded storage canisters into the onsite transport cask.

The transfer cell would be constructed of material such as steel plate to provide necessary radiation shielding and facilitate dismantlement after use. One or more viewing windows and remote manipulators would be provided, along with ventilation utilizing high-efficiency particulate air (HEPA) filters.

To avoid the need to remove the shielded transport cask from the trailer, the transfer cell would be designed so that trailer can be backed up to it to position the cask to receive a loaded shielded storage canister. With this arrangement, the trailer would be supported by jacks for stability, the open end of the onsite transport cask would be positioned within the outer part of the transfer cell to provide necessary radiation shielding, and the loaded shielded canister would be inserted into the cask and the cask shield plug installed. Figure 7-2 shows the conceptual arrangement.

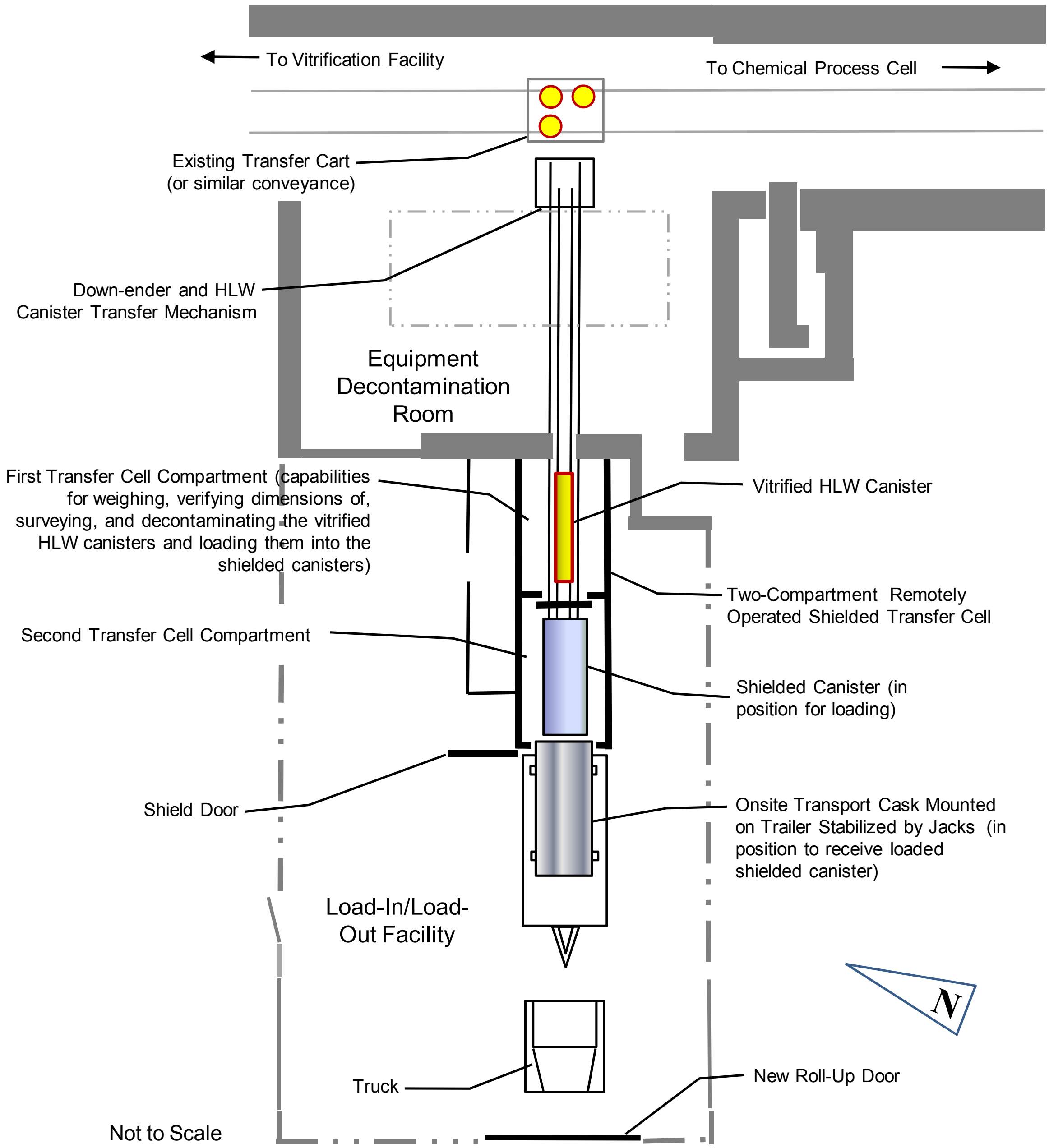


Figure 7-2. Conceptual Arrangement for Transferring Vitrified HLW Canisters

Construction of the New Canister Interim Storage Facility

The new Canister Interim Storage Facility would be constructed on the south plateau near the rail spur. The facility would consist of a reinforced concrete pad with reinforced concrete storage modules to provide radiation shielding and mechanical protection. The concrete pad would be sufficient in size and load capacity to accommodate reinforced concrete storage modules for the 69 loaded shielded canisters.

Figure 7-3 shows the conceptual design for a storage module, which is similar to the NUHOMS® standard horizontal storage module provided by AREVA (Transnuclear Incorporated) for dry storage of containerized spent nuclear fuel. (This design is provided as an example only and its inclusion here does not imply that DOE would necessarily select this interim storage system, which is among a variety of systems approved by NRC for general use that would be considered by DOE.)

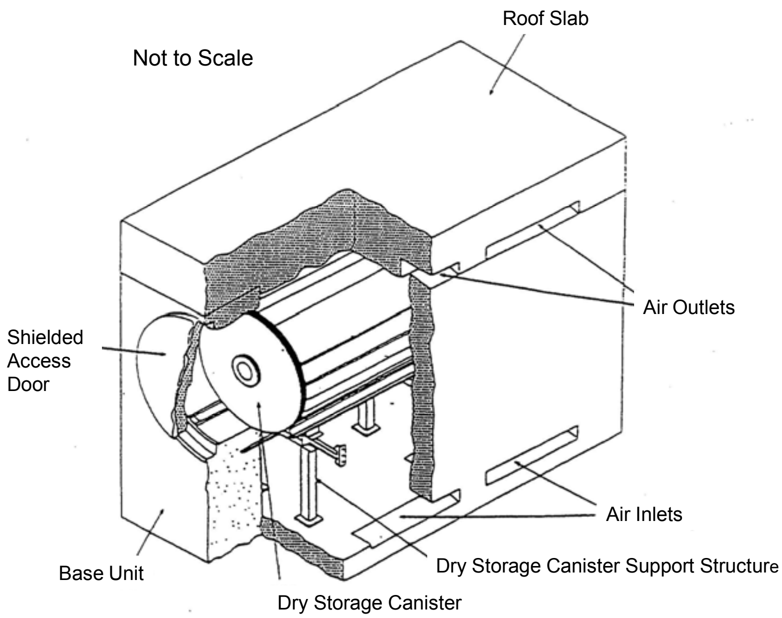


Figure 7-3. Storage Module Conceptual Design (from WVNSCO and Scientech 2000)

Appropriate fence(s), lighting, and remote monitoring equipment for security purposes would be provided. DOE would consider applicable NRC guidance in detailed design of the new Canister Interim Storage Facility, such as that found in NUREG-1536, *Standard Review Plan for Dry Cask Storage Systems* (NRC 1997). DOE would provide information on the detailed design of the facility to NRC and consult with NRC on preparation of the related safety analysis report.

Moving the Vitrified HLW Canisters to the New Canister Interim Storage Facility

A process such as the following would be used to transport the vitrified HLW canisters to the new Canister Interim Storage Facility:

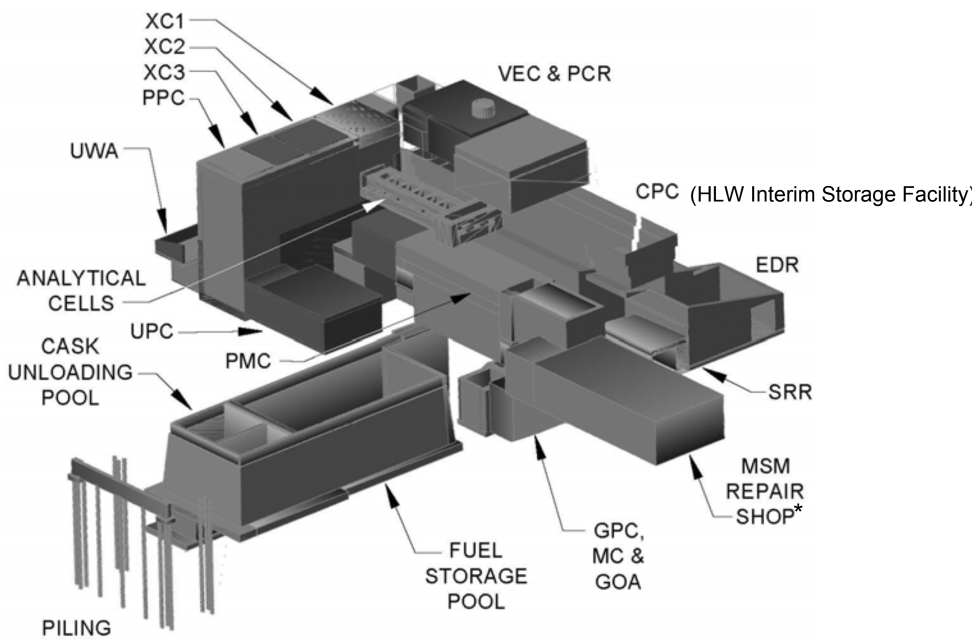
- Readiness reviews would be performed to ensure that all preparations for the move have been satisfactorily completed;
- The first shielded canister would be placed inside the shielded transfer cell;
- The onsite transport cask to receive the first shielded canister would be moved into the Load-In/Load-Out Facility and positioned next to the transfer cell;
- The first group of four vitrified HLW canisters would be moved into the Equipment Decontamination Room on the transfer cart or similar conveyance;

- The vitrified HLW canisters would be lifted from the cart one by one, lowered to a horizontal position, and moved into the transfer cell where appropriate measurements would be taken;
- After measurements and any necessary decontamination are completed, each of the four vitrified HLW canisters would be loaded into a shielded canister and the shielded canister would be loaded into the onsite transport cask; and
- The cask would be transported to the new Canister Interim Storage Facility where the shielded canister would be inserted into the designated reinforced concrete storage module and the module shielded access door installed.

This process would be repeated until all 275 vitrified HLW canisters have been relocated to the new Canister Interim Storage Facility.

7.3.3 Removing the Above-Grade Portion of the Process Building

As explained in Section 3, the Process Building is a complex structure comprised of various shielded cells, rooms, aisles, and supporting areas. It is approximately 270 feet long, 130 feet wide, and stands 79 feet above ground. Much of the structure is formed of heavily reinforced concrete. Figure 7-4 illustrates the Process Building and identifies key areas.



LEGEND:
CPC = Chemical Process Cell
EDR = Equipment Decontamination Room
GOA = General Purpose Cell Operating Aisle
GPC = General Purpose Cell
MC = Miniature Cell
MSM = Master-Slave Manipulator
PCR = Process Chemical Room
PMC = Process Mechanical Cell
PPC = Product Purification Cell
SRR = Scrap Removal Room
UPC = Uranium Product Cell
UWA = Upper Warm Aisle
VEC = Ventilation Exhaust Cell
XC1 = Extraction Cell 1
XC2 = Extraction Cell 2
XC3 = Extraction Cell 3

*The MSM Repair Shop and the Contact Size-Reduction Facility now located in this area will be removed before the decommissioning begins.

Figure 7-4. Process Building General Arrangement

Removal of the above-grade portion of the Process Building would be performed as specified below. The below-ground portion of the building would be removed as specified in Section 7.3.8. As indicated previously, this work would be performed in accordance with the Decommissioning Work Plan, which would provide more details on the activities described below.

Removing Equipment

Equipment would be removed during demolition of the building. Equipment to be removed from the areas that supported interim storage of the vitrified HLW canisters includes the canister storage racks and ventilation equipment in the HLW Interim Storage Facility, remote manipulators, the two cranes in the Chemical Crane Room, the vitrified HLW canister handling equipment in the Equipment Decontamination Room, and various pieces of ventilation equipment.

Other equipment remaining inside the Process Building after the interim end state is reached – such as the vessels in the Liquid Waste Cell, other vessels and equipment, the other cranes, and the master-slave manipulators – would also be removed. This equipment would be size reduced as necessary, characterized, packaged, and disposed of offsite. Size reduction would be accomplished either in the areas where the equipment is located or in another area set up for this purpose, such as the Vitrification Cell in the Vitrification Facility.

Removing Hazardous and Toxic Materials

Hazardous and toxic materials in the building would be removed to the extent practical before demolition. These materials would include:

- Any remaining temporary lead shielding and all permanently-installed lead shielding from areas such as the wall outside of the Off-Gas Blower Room and the shield doors and door frames in the Radiological Counting Room;
- The lead-glass viewing windows, whose frames contain lead;
- Any remaining bulk hazardous materials;
- Any electrical equipment known to contain polychlorinated biphenyls (PCBs); and
- Any remaining piping insulation known to contain asbestos.

These materials would be size reduced as necessary, characterized, packaged, and disposed of at an appropriate offsite disposal facility.

Completing Process Building Decontamination

Process Building areas known to have significant residual radioactivity would be evaluated and decontaminated as necessary to support unconfined demolition of the building, including the following areas used to support vitrified HLW canister storage:

- HLW Interim Storage Facility
- Chemical Crane Room
- Ventilation Exhaust Cell
- Head-End Ventilation Building

- Equipment Decontamination Room

The process used would involve activities such as the following:

- Removing remaining equipment from these areas, size reducing it as necessary, characterizing it, packaging it, and disposing of it at appropriate offsite disposal facilities;
- Performing radiological characterization surveys as specified in Section 9 to assess the extent of contamination on facility surfaces; and
- On the basis of characterization data results, verify that the process building can be demolished without exceeding National Emission Standards for Hazardous Air Pollutants (NESHAP) limits (40 CFR 61), making use of the CAP88-PC code (EPA 2007) and considering other sources of airborne radioactivity emissions during the calendar year in which the demolition would be accomplished.

Removing the Building to Grade Level

The Process Building would be demolished to grade level using conventional demolition methods such as those described in Section 7.11. Fixatives would be applied to building surfaces with significant radioactive contamination before this is accomplished to help avoid the need for radiological containment. The resulting debris would be sized reduced as necessary, packaged for disposal or managed as bulk waste, and disposed of offsite at an appropriate waste disposal facility.

Demolition of the building to grade level would be coordinated with demolition of other WMA 1 facilities and installation of the vertical hydraulic barrier wall for the WMA 1 excavation described in Section 7.3.8.

7.3.4 Removing the Above-Grade Portion of the Vitrification Facility

As explained in Section 3, this structural steel frame and sheet metal building houses the reinforced concrete Vitrification Cell, operating aisles, a control room, and other support areas. It is approximately 91 feet wide and 150 feet long. The peak of the roof stands approximately 50 feet high with the crane house extending another 26 feet above the roof. Figures 3-11 through 3-21 show the outside of the building and representative interior areas.

Removal of the above-grade portion of the Vitrification Facility would be performed as specified below. The below-grade portion of the building would be removed as specified in Section 7.3.8.

Preparing for Facility Removal

Preparations to remove the Vitrification Facility to grade would be similar to those for the Process Building. Installed equipment would be removed as necessary, along with the nine lead glass viewing windows in the Vitrification Cell and any remaining hazardous and toxic materials. Residual radioactivity levels inside the Vitrification Cell would be evaluated to ensure compliance with NESHAP emission limits during demolition. Fixatives would be applied to surfaces with significant radioactive contamination levels.

Removal of the Facility to Grade Level

After such preparations are completed, the Vitrification Facility would be removed to grade level using conventional demolition methods such as those described in Section 7.11. The thick reinforced concrete walls and roof structures would be segmented as necessary using a technique such as diamond wire cutting.

The resulting debris would be sized reduced as necessary, packaged for disposal or managed as bulk waste, and disposed of offsite at an appropriate waste disposal facility. The demolition work would be coordinated with demolition of the Process Building and the other WMA 1 facilities and with removal of piping in the HLW transfer trench in WMA 3, which connects to the north side of the building.

7.3.5 Removing the 01-14 Building and the Vitrification Off-Gas Line

As indicated in Section 3, the four-story 01-14 Building stands at the southwest corner of the Process Building. Figures 3-11 shows the building. The 10-inch vitrification off-gas line runs from the Vitrification Facility to the 01-14 Building in a 340 feet long subgrade concrete trench.

An approach such as the following would be used to remove this building to its floor slab and foundation:

- Performing characterization surveys;
- Removing any remaining equipment from the building, along with any hazardous or toxic materials and the lead-glass viewing window (the frame contains lead);
- Decontaminating the building structure and applying fixatives if necessary to allow demolition without the use of containment; and
- Demolishing the structure to its floor slab and foundation, as well as the cement silo and the entrance enclosure; and
- Characterizing the resulting debris, packaging it for disposal or managing it as bulk waste, and disposing of it at an offsite disposal facility.

The floor slab and foundation would remain in place temporarily and would be removed in connection with the excavation of the underground portions of the Process Building and Vitrification facility and the source area of the north plateau groundwater plume.

The off-gas line would be cut into segments, removed from the concrete trench, characterized, packaged for disposal, and disposed of at an offsite disposal facility. The trench itself would remain in place temporarily and would be removed in conjunction with removal of the WMA 1 subgrade structures and the plume source area.

7.3.6 Removing the Load-In/Load-Out Facility

As explained in Section 3, this 60 feet by 70 feet by 54 feet high steel building has a concrete floor. The process for removal of this building would be similar to the process used for the 01-14 Building and would include major steps such as the following:

- Performing characterization surveys;

- Removing equipment such as the vitrified HLW canister handling system, lead glass windows in the transfer cell, and the crane;
- Decontaminating the facility and applying fixatives to surfaces with significant radioactive contamination to facilitate demolition without containment;
- Demolishing the structure to its floor slab and foundation; and
- Characterizing the resulting debris, packaging it for disposal or managing it as bulk waste, and disposing of it at an offsite disposal facility.

The floor slab and foundation would remain in place temporarily and would be removed in conjunction with removal of the WMA 1 subgrade structures and the plume source area.

7.3.7 Removing Other WMA 1 Structures

The remaining WMA 1 structures would be removed to their concrete floor slabs and foundations, which would removed during excavation of the subgrade structures and the plume source area.

Utility Room and Utility Room Expansion

The Utility Room and the Utility Room Expansion are concrete block structures containing site utilities as explained in Section 3. The proposed decommissioning process for these facilities would include steps such as the following:

- Performing characterization surveys,
- Removing equipment from the building, along with any hazardous or toxic materials;
- Demolishing the building to its floor slab and foundation;
- Characterizing the resulting debris, managing it as bulk waste, and disposing of it at an offsite disposal facility.

Plant Office Building

The three-story concrete block Plant Office Building is shown in Figures 3-11 and 7-1. Decommissioning this structure would entail a process such as the following:

- Performing characterization surveys;
- Removing equipment from the building, along with any hazardous or toxic materials;
- Demolishing the building to its floor slab and foundation; and
- Characterizing the resulting debris, managing it as bulk waste, and disposing of it at an offsite disposal facility.

Fire Pump House

As of mid-2008, this 20 feet by 24 feet by 10 feet high steel building was not known to have been impacted by radioactivity. Decommissioning this structure would entail a process such as the following:

- Performing characterization surveys to confirm that the building is not impacted by radioactivity;
- Removing equipment only to the extent necessary to support building demolition; and
- Demolishing the building to its floor slab and foundation, disposing of the debris in an offsite landfill.

Water Storage Tank

This 475,800-gallon tank was not known to have been impacted by radioactivity as of late 2008. Decommissioning would entail emptying the tank, draining the water to the storm sewer system, and dismantling the tank.

Electrical Substation

This 34.5 kilovolt/480 volt transformer was not known to have been impacted by radioactivity as of late 2008. Decommissioning would entail de-energizing it and removing it, with the equipment containing PCBs managed in accordance with applicable State and U.S. Environmental Protection Agency requirements.

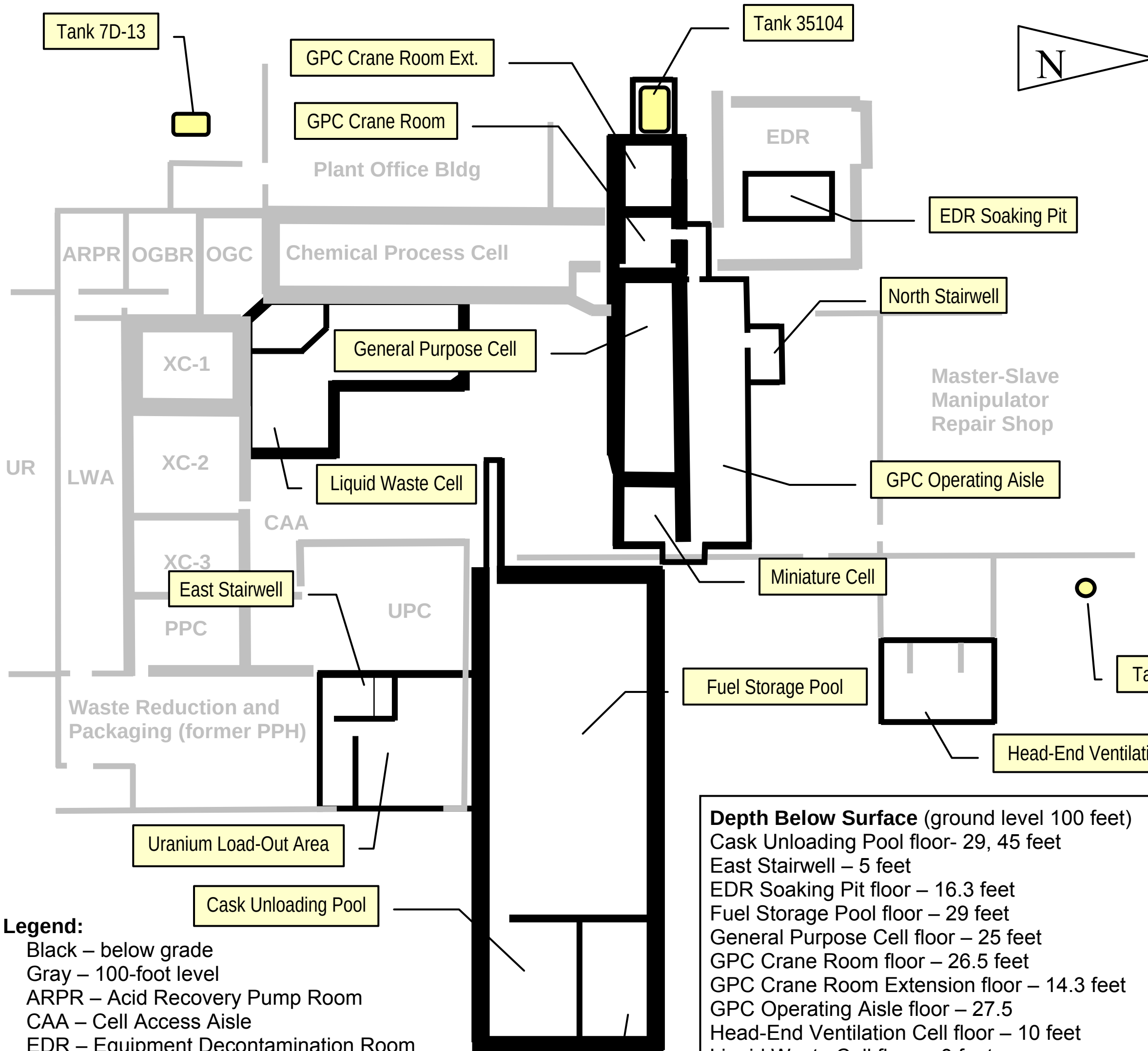
7.3.8 Removing the Underground Structures and Equipment and the Plume Source Area

Figure 7-5 shows the layout of the underground portions of the Process Building. The floor of the melter pit in the Vitrification facility, which is not shown on this figure, also extends approximately 14 feet below grade.

To facilitate removal of the underground structures of the Process Building and Vitrification Facility, along with the source area of the north plateau groundwater plume, an area larger than the footprint of both buildings would be excavated. Figure 7-6 shows this area.

Figure 7-6 provides information on Sr-90 contamination in groundwater that represents the upgradient portion of the north plateau groundwater plume based on measurements made in the 1998 investigation (Hemann and Steiner 1999). This figure also shows the location of the main source of the plume, identified near the bottom of the drawing as “7P-240 Release,” and key underground lines in the area.

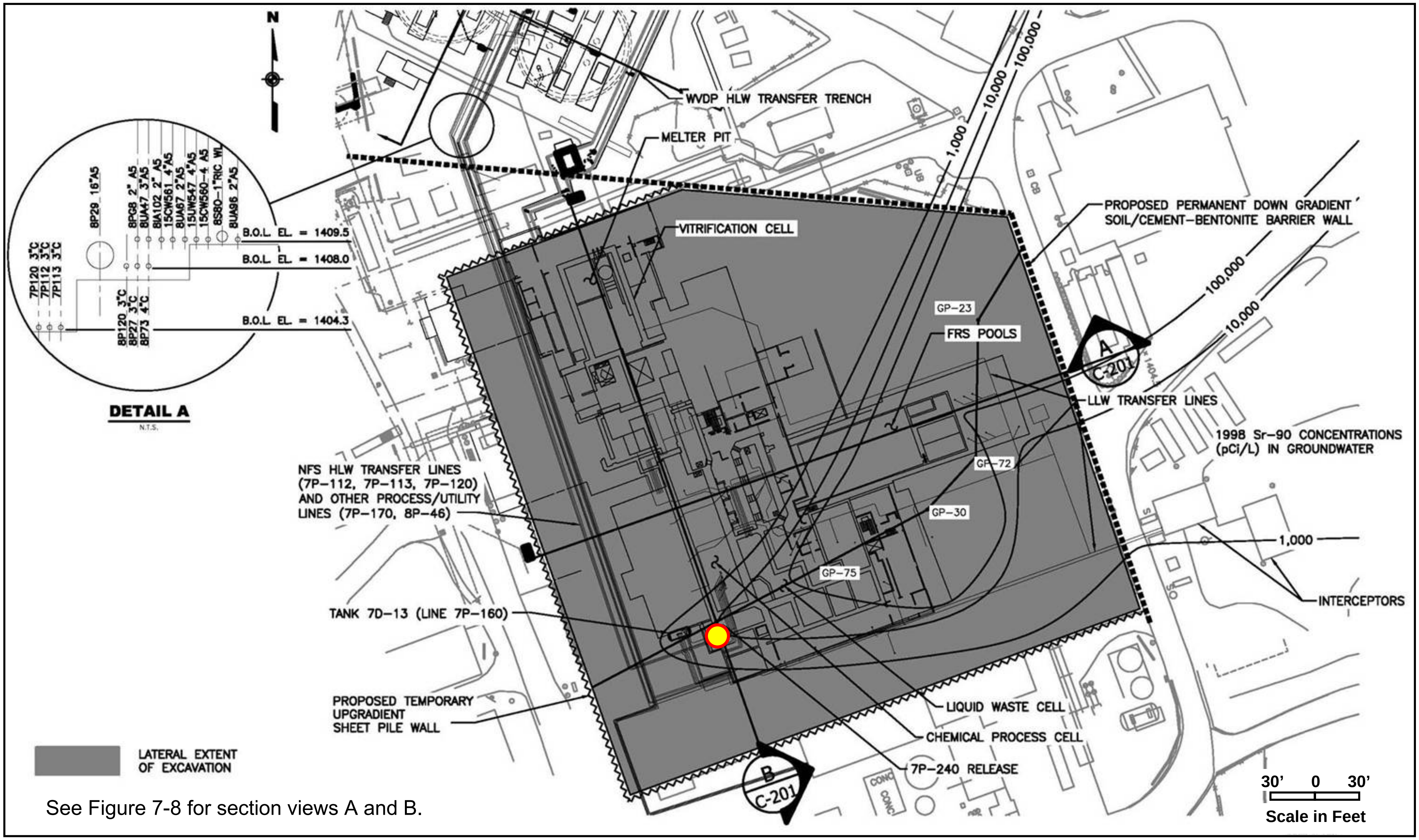
Figure 7-7 shows a cross section view of the excavation. This figure also shows key soil contamination data from Geoprobe® samples collected in the 1998 investigation (Hemann and Steiner 1999).



Depth Below Surface (ground level 100 feet)
Cask Unloading Pool floor- 29, 45 feet
East Stairwell – 5 feet
EDR Soaking Pit floor – 16.3 feet
Fuel Storage Pool floor – 29 feet
General Purpose Cell floor – 25 feet
GPC Crane Room floor – 26.5 feet
GPC Crane Room Extension floor – 14.3 feet
GPC Operating Aisle floor – 27.5
Head-End Ventilation Cell floor – 10 feet
Liquid Waste Cell floor – 8 feet
Miniature Cell floor – 24 feet
North Stairwell , lowest landing feet – 24.5 feet
Tank 7D-13 bottom – 14 feet
Tank 35104 vault floor – 13.3 feet
Tank 15D-6 bottom – 15.5 feet
Uranium Load-Out Area – 5 feet (level with outside grade)
Water Treatment Area floor – 29 feet

Legend:
Black – below grade
Gray – 100-foot level
ARPR – Acid Recovery Pump Room
CAA – Cell Access Aisle
EDR – Equipment Decontamination Room
LWA – Lower Warm Aisle
OGBR – Off-Gas Blower Room
OGC – Off-Gas Cell
PPC – Product Purification Cell
PPH – Product Packaging and Handling Area
UPC – Uranium Product Cell
UR – Utility Room
XC-1 – Extraction Cell 1
XC-2 – Extraction Cell 2
XC-3 – Extraction Cell 3

Figure 7-5. Layout of Process Building Underground Structures



See Figure 7-8 for section views A and B.

Figure 7-6. Conceptual Layout of WMA 1 Excavation

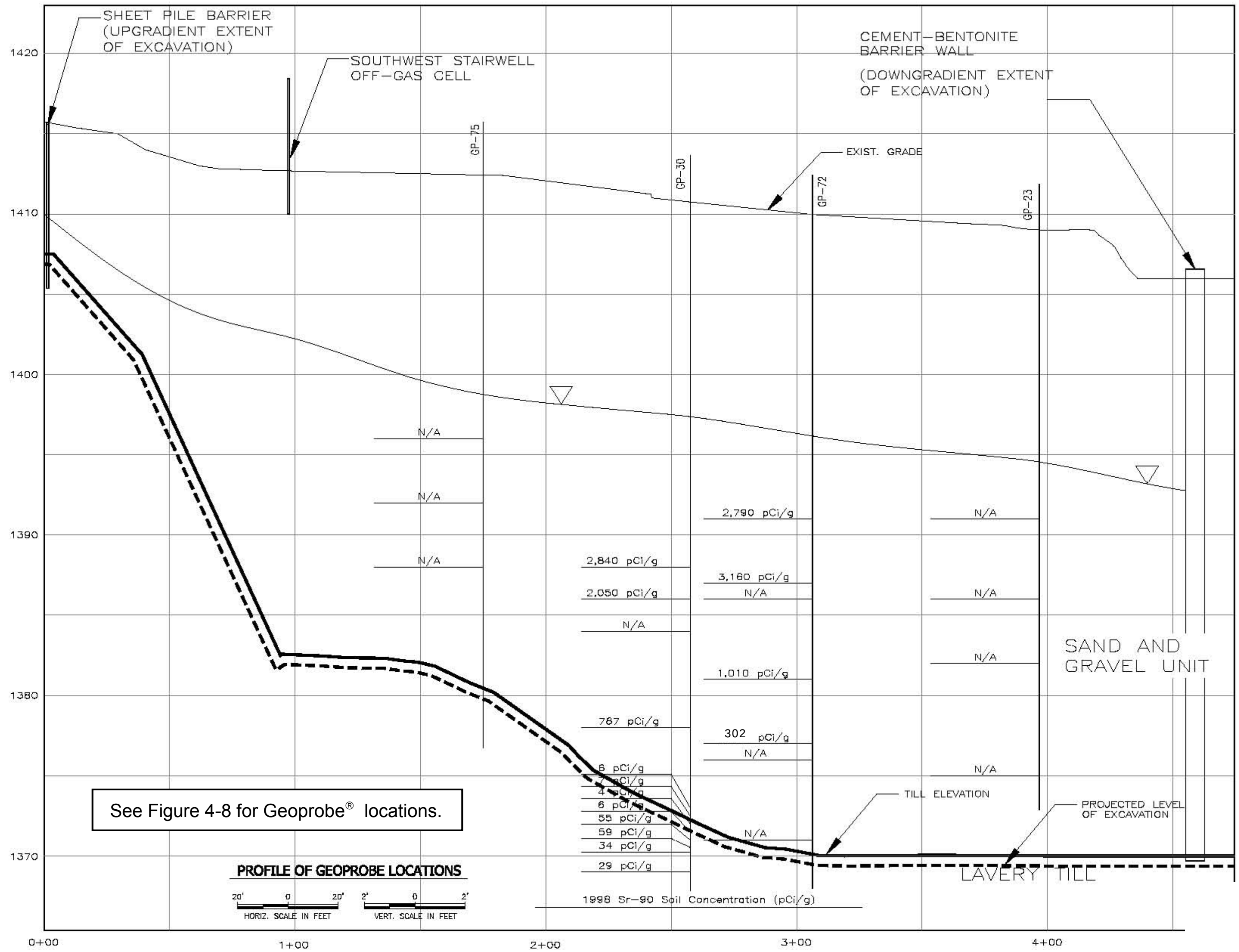


Figure 7-7. Conceptual WMA 1 Excavation Contour, With Selected Subsurface Soil Data

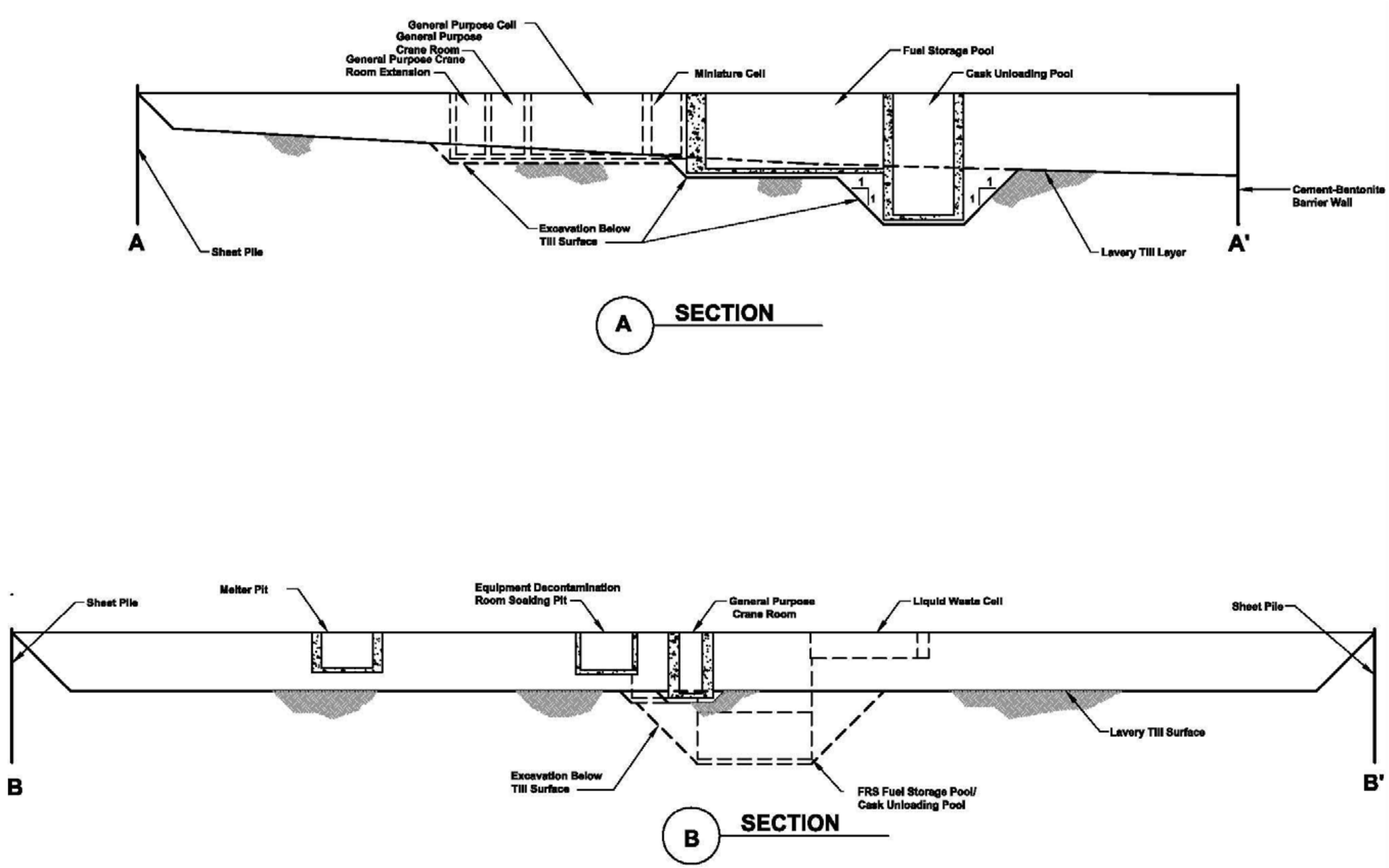


Figure 7-8. Excavation Cross Sections (From URS Drawing C-102)

Excavation Conceptual Design

The horizontal limits of the excavation would be based primarily on physical considerations, although consideration would also be given to analytical data on subsurface soil contamination at the planned excavation boundary acquired early during Phase 1. As can be seen in Figure 7-6, the western edge of the excavation would lie near the road in front of the Plant Office Building. The northern edge of the excavation would follow the walkway between the Vitrification Facility and the Waste Tank Farm. The eastern edge would follow the road between the Process Building area and the interceptors. The southern edge would correspond with a line running immediately south of the 01-14 Building, the Utility Room, and the Utility Room Expansion. The footprint of the excavation would comprise approximately three acres.

The depth of the excavation would vary depending on the subsurface structures. Figure 7-8 shows two representative cross sections (which are identified on Figure 7-6).

Hydraulic Barrier Wall Installation

To control groundwater, a vertical hydraulic barrier would be installed around the area to be excavated as shown in Figure 7-6 and Figure 7-7. The upgradient portion would be built of sheet pile. The downgradient portion would consist of a soil-cement-bentonite slurry wall. Both would extend approximately two feet into the Lavery till and the slurry wall would remain in place after the excavation is backfilled.

Before the hydraulic barrier wall is installed, underground lines in its footprint that carried radioactive liquid would be located. Sections of these lines in the area where the barrier walls would be constructed would be removed in a controlled manner to avoid unnecessary release of contamination. During this process, characterization measurements would be taken in the end of each line that would remain in place outside of the excavation and the line capped.

The total length of the slurry wall would be approximately 750 feet, with approximately 525 feet of this length directly adjacent to the WMA 1 area to be excavated. The 525-foot portion of the slurry wall adjacent to the area to be excavated would be sufficiently wide to provide the stability necessary to permit excavation up to the base of the wall, with the remainder a more typical two foot width. The extra width of the main portion of the slurry wall and the inclusion of cement in the mixture would provide the stability necessary to accommodate the nearby excavation.[5]

The sheet pile section of the hydraulic barrier wall would be installed using a conventional pile driver. Construction of the soil-cement-bentonite slurry wall would involve activities such as the following:

- Making preparations to handle the soil to be excavated, with characterization data, including data collected during the excavation process, used to determine the portion of the soil that is radioactively contaminated;
- Using a hydraulic excavator to dig the trench for installation of the slurry wall;
- Preparing the slurry and backfill mixtures in earthen containment berms that would be constructed near the slurry wall;
- Keeping the trench filled with slurry during the excavation process to help support the trench walls during the excavation;

[5] Consideration of industry experience in use of slurry walls at the boundaries of deep excavations indicates that the barrier planned for the WMA 1 excavation would perform as planned in controlling groundwater intrusion and supporting the excavation design. The extra thickness would accommodate some excavation into the upper portion of the barrier wall with sufficient thickness remaining to ensure satisfactory performance.

- Backfilling the trench with a mixture of clean soil, cement, and bentonite to displace the slurry, which would then be used to continue the trench excavation;
- Collecting the radioactively contaminated removed soil in lift liners, adding absorbent to the saturated soil, and transporting it offsite for disposal as low specific activity waste; and
- Disposing of the uncontaminated soil at an appropriate offsite disposal facility..

The resulting slurry wall would have a maximum in-place saturated hydraulic conductivity of 6.0E-06 cm/s. It would extend to within about three feet of grade and be topped with uncontaminated soil.

Preparations for Removal of Contaminated Soil and Groundwater

Removal of contaminated soil and groundwater is addressed first because of the issues in dealing with highly contaminated soil expected beneath the Process Building. However, removal of the underground structures and equipment would be coordinated with soil removal since the north plateau plume source area lies beneath the Process Building. Detailed planning for the excavation would take into account available information on radioactivity in the soil and groundwater as summarized in Section 4.2 and the results of the soil characterization program. The depth of the water table in the area – typically about 10 feet below the surface – would also be taken into account.

Preparations, in addition to installation of the hydraulic barrier wall, would include installation of extraction wells to dewater the excavation. The removed water would be sent to the Low-Level Waste Treatment Facility for treatment prior to discharge through a State Pollutant Discharge Elimination System (SPDES)-permitted outfall or, as an alternative, a portable wastewater treatment system using ion exchangers and filters provided for this purpose. Preparations would also include making provisions for appropriate radiological controls, such as design and erection of a pre-engineered confinement structure over the north plateau plume source area or over the entire excavation to provide for weather protection and airborne radioactivity control.

Removal of Contaminated Soil and Groundwater

Before excavation begins, the hydraulic barrier wall would be installed, the sheet piles installed, the dewatering wells installed and placed in operation, and appropriate radiological controls established. The excavation process would be accomplished in two phases using conventional excavation equipment.

The first phase would involve removal of soil in the vadose zone, except for the soil in the north plateau plume source area and soil immediately downgradient of this area. Excavation of soil in the saturated zone would begin after the dewatering wells have removed groundwater in the confined area to the extent practical. The groundwater would be treated as discussed previously and discharged to Erdman Brook through a SPDES-permitted outfall after confirmation that radioactivity concentrations are acceptably low. The groundwater extraction wells would be removed during the excavation.

Soil would be excavated to a depth of at least one foot into the Lavery till, with the extent of additional soil removal determined by the use of the cleanup goals specified in the Section 5. Remedial action surveys would be performed during the course of the work and soil on the bottom and sides of the excavation with radioactivity concentrations exceeding the cleanup goals would be removed and disposed of offsite as radioactive waste.[6] Contaminated soil with radioactivity

[6] It is unlikely that the sides of the excavation that are not hydraulically downgradient will be contaminated. In any case, the extent of soil remediation on the sides of the excavation would be limited by the excavation boundaries.

concentrations below cleanup goals would be removed where practical, consistent with the ALARA process as described in Section 6 and Section 7.2.2. Soil would be excavated as close to the hydraulic barrier wall as practical. The other sides of the excavation would have a slope of approximately 45 degrees as indicated on Figure 7-8.

Removal of Underground Structures, Floor Slabs, and Foundations

The demolition of below-grade cells and structures shown in Figure 7-5 would be coordinated with the removal of the three underground tanks, the underground piping, and contaminated soil associated with the source area of the north plateau groundwater plume. All remaining concrete floor slabs and foundations in the area, including those outside of the excavation, would be removed early in the process to facilitate the excavation work. After soil is excavated to expose their structures, the below-grade cells would be demolished with conventional demolition equipment such as diamond wire saws.

The foundation pilings supporting the Process Building would be cut off at the bottom of the excavation or slightly below the bottom and the cut-off portion removed as well. All demolition debris would be characterized and disposed of offsite. In connection with this work, samples of soil would be collected around representative pilings, including at points several feet below the surface. Analytical data from the samples would be used to evaluate the potential for preferential flow paths around the pilings and be considered in the Phase 1 final status surveys described in Section 9.

Removal of Underground Tanks and Piping

The three underground tanks and radioactively contaminated underground piping within the excavated area would be removed and disposed of as radioactive waste. Planning for underground line removal would take into account one line of particular interest: waste transfer line 7P120-3, which is expected to contain high levels of residual radioactivity as described in Section 4.1. The concrete off-gas trench would be removed. (Removal of the piping in the trench was provided for in Section 7.3.5.)

Duriron wastewater piping under the Process Building and east of the building, which contains lead in the piping joints, would be cut near the joints, with pieces containing the joints being disposed of as mixed waste. The remainder of this piping would be disposed of as LLW.

This process would apply to radioactive lines and also to nonradioactive sanitary lines and utility lines, which would be removed during the course of the work because it is unlikely that it would be practicable to leave them in place. Underground piping outside of the excavation would remain in place.

7.3.9 Site Restoration

Once the below-grade structures of the Process Building and Vitrification Facility, the three wastewater tanks, the underground piping, and the remaining concrete floor slabs and foundations have been removed, and the underlying contaminated soils associated with the source area of the north plateau groundwater plume have been removed, a Phase 1 final status survey would be performed in the excavation bottom and sides as specified in Section 9 to verify that residual radioactivity levels are below the cleanup goals. Special attention would be paid to areas around the remaining sections of the Process Building support pilings. Surveys performed around the support pilings would extend to sufficient depth to evaluate the extent, if any, of the downward

That is, any soil found to exceed the cleanup goals would be removed only within the confines of the downgradient hydraulic barrier wall and the sheet piles installed on the other sides of the excavation.

migration of contamination along the pilings. Arrangements would also be made for an independent verification survey to be performed on behalf of the regulatory agencies.

After the verification survey is completed and regulatory approval is received, the area would be backfilled with uncontaminated earth and graded as necessary to restore to it a near natural appearance. The backfill material would be obtained from similar offsite geologic deposits. The properties of this material (especially the texture, hydraulic conductivity, and distribution coefficients) would be similar to those of the sand and gravel layer on the project premises as described in Section 3.

A French drain would be emplaced during backfilling of the excavation to prevent groundwater from mounding near the hydraulic barrier wall. Water from the French drain would be allowed to passively discharge into a small tributary of Erdman Brook. More detail on the French drain design appears in Appendix D.

The sheet pilings installed on the upgradient sides of the excavation would be removed after the excavation is backfilled. The piling and any confinement structure used would be disposed of offsite at appropriate waste disposal facilities.

Appendix D addresses monitoring and maintenance of the WMA 1 area between the completion of Phase 1 of the proposed decommissioning and the beginning of Phase 2. Appendix D also provides information on expected changes to the groundwater flow field that would occur with completion of the Phase 1 proposed decommissioning activities in WMA 1.

7.4 WMA 2 Proposed Decommissioning Activities

This section addresses proposed decommissioning of the Low-Level Waste Treatment Facility area, which is shown in Figure 7-9.

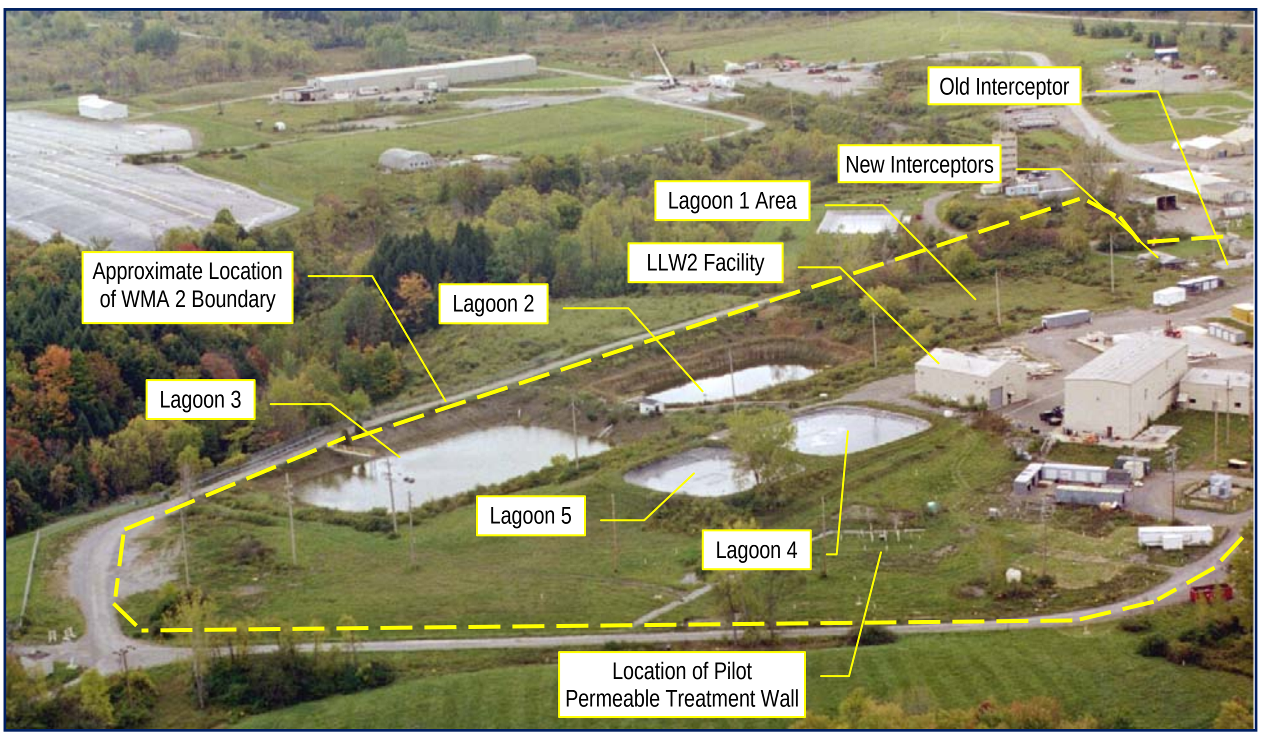


Figure 7-9. WMA 2 in 2007

The sequence for the Phase 1 proposed decommissioning activities in WMA 2 would be developed during detailed planning. The LLW2 facility would be kept in service until it is no longer needed to treat the water in the lagoons and contaminated groundwater removed from the excavation before it is discharged though an SPDES-permitted outfall into Erdman Brook.

Demolition debris, soil, sediment, and other material removed during this work would be characterized for waste management purposes and disposed of at appropriate offsite waste disposal facilities. Absorbents would be added as necessary to containers of wet contaminated soil to absorb moisture.

7.4.1 Characterizing Soil and Sediment

Soil and sediment in WMA 2 would be characterized for residual radioactivity in accordance with the Characterization Sample and Analysis Plan described in Section 9. The results of this effort would be used in planning the excavation work described below. (This characterization would not include subsurface soil in areas impacted by the north plateau groundwater plume except in the portion of WMA 2 where the excavation would be located.)

7.4.2 Removing Structures

The structures in WMA 2 would be removed with appropriate radiological controls, along with the remaining concrete floor slabs and foundations. Removal of the Neutralization Pit, the Old Interceptor, the New Interceptors, and Lagoons 1, 2, and 3 would be coordinated with digging the WMA 2 excavation addressed in Section 7.4.3, which would encompass the area of these facilities as well as the Solvent Dike. During this process, characterization measurements would be taken in the end of each underground line that would remain in place and the line capped.

LLW2 Facility

This metal-sided building with skid-mounted process equipment and a 900-gallon stainless steel lined sump is expected to contain low levels of radioactive contamination. Its demolition would involve activities such as the following:

- Removing the process equipment;
- Removing any water in the sump, stabilizing it in cement for disposal as LLW;
- Demolishing the structure to grade level;
- Removing the floor slab and foundation and the sump liner;
- Removing soil under the floor slab and foundation to a depth of approximately two feet[7];
- Performing Phase 1 final status surveys in the area excavated for these purposes;
- Making arrangements for any independent confirmatory surveys to be performed in the excavated area; and
- Filling in the excavated area with clean earthen backfill.

[7] The two-foot prescriptive excavation depth was selected to avoid unnecessary excavation into soil contaminated by the north plateau groundwater plume during Phase 1 of the decommissioning. As noted previously, the plume would be among the sources considered in Phase 2 of the decommissioning.

Neutralization Pit

The Neutralization Pit would be removed using a process similar to the following:

- Removing any residual water, treating it for disposal via an SPDES-permitted outfall or solidifying it for disposal as LLW; and
- Removing the liner, concrete walls, and floor of the pit.

The underground wastewater lines in the area of the Neutralization Pit would be removed in connection with digging the WMA 2 excavation described in Section 7.4.3. Phase 1 final status surveys, independent confirmatory surveys, and filling the excavation are also addressed in Section 7.4.3.

Old Interceptor

The Old Interceptor would be demolished using a process similar to that used for the Neutralization Pit, with additional radiological controls appropriate to the larger amount of residual radioactivity it contains.

New Interceptors

The New Interceptors would be demolished using a process similar to that used for the Neutralization Pit.

Concrete Floor Slabs and Foundations

The concrete floor slabs of the O2 Building, Test and Storage Building, Vitrification Test Facility, Maintenance Shop, Maintenance Storage Area, and the Vehicle Maintenance Shop would be removed and the building footprints excavated approximately two feet below grade. Phase 1 final status surveys would be performed in the excavated areas, and arrangements made for an independent verification survey if desired by the regulators. After the surveys have been completed, the excavations would be filled with earth.

7.4.3 Decommissioning the Lagoons

Decommissioning of Lagoons 1, 2, and 3 would involve constructing a vertical hydraulic barrier on the northwest side of the lagoons and digging a single large excavation. Lagoons 4 and 5 would be removed separately. Figure 7-10 shows the conceptual plan view of the large excavation and the location of the hydraulic barrier wall. Figure 7-11 shows the conceptual cross section.

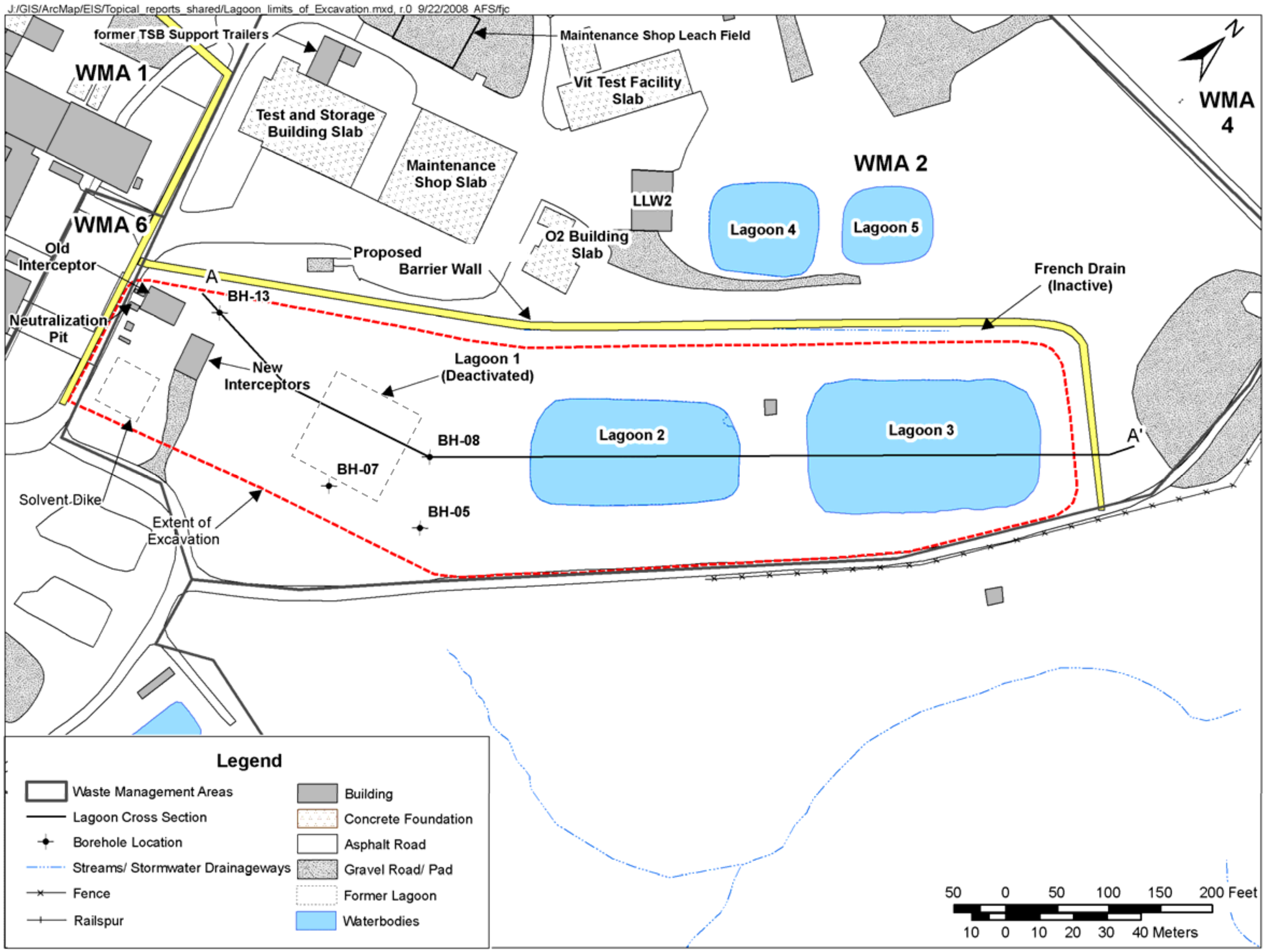


Figure 7-10. Conceptual Arrangement of WMA 2 Excavation, Plan View

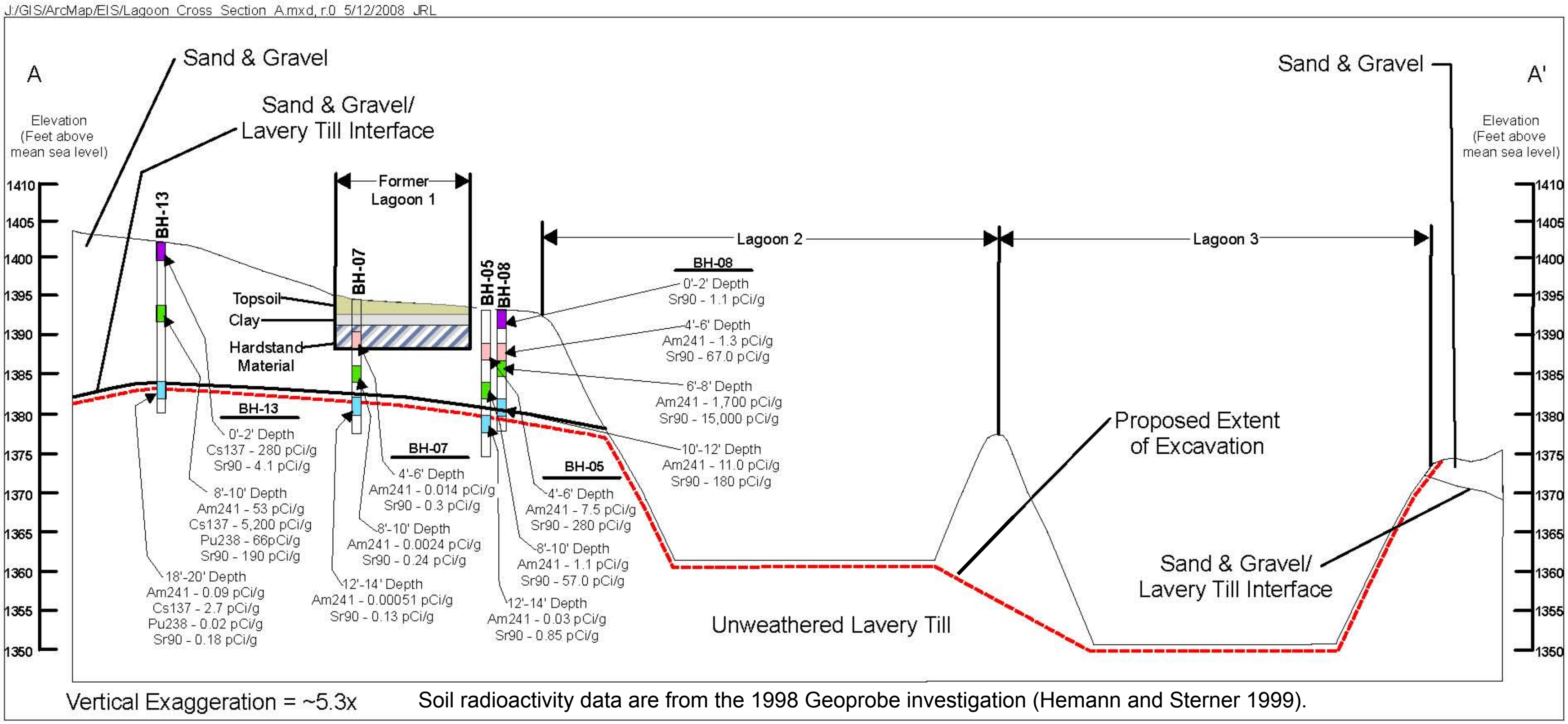


Figure 7-11. Conceptual Arrangement of WMA 2 Excavation, Cross Section

Hydraulic Barrier Wall Installation

To isolate the area of WMA 2 to be excavated from the north plateau groundwater plume, a vertical hydraulic barrier wall would be installed as shown in Figure 7-10. This hydraulic barrier would consist of a soil-cement-bentonite barrier wall that would extend approximately two feet into the Lavery till. It would remain in place after the excavation is backfilled.

Before the hydraulic barrier wall is installed, underground lines in its footprint that carried radioactive liquid would be located. Sections of these lines in the area where the wall would be constructed would be removed in a controlled manner to avoid unnecessary release of contamination. During this process, characterization measurements would be taken in the end of each line that would remain in place and the line capped.

The total length of the barrier wall would be approximate 1100 feet. It would be sufficiently wide to provide the stability necessary to permit excavation up to the base of the wall. This barrier wall would connect with the WMA 1 hydraulic barrier wall as shown in Figure 7-10. It would be constructed in the same manner as the WMA 1 slurry wall and have an in-place maximum saturated hydraulic conductivity of approximately 6E-06 cm/s. It would extend to within about three feet of grade and be topped with excavated material. Sheet piles on the southeastern side of the excavation are not expected to be necessary to control groundwater, except possibly in the Lagoon 1 area as indicated below.

Preparations for Removal of Contaminated Lagoon Sediment and Soil

Detailed planning for the excavation would take into account available information on radioactivity in the lagoon sediment, soil, and groundwater as summarized in Section 4, along with the results of the soil characterization program. The depth of the water table in the area – typically about seven feet below the surface – would also be taken into account.

Preparations, in addition to installation of the hydraulic barrier wall, would include provisions for appropriate radiological controls to minimize airborne radioactivity releases during the excavation work, such as a single-span confinement structure for the Lagoon 1 area.

Removal of Contaminated Soil and Underground Wastewater Lines

Removal of Lagoons 1, 2, and 3 and the facilities within the area to be excavated as described below would be coordinated with removal of soil in other parts of the excavation. Before excavation begins, the hydraulic barrier wall would be installed. The excavation process would be accomplished in two phases using conventional excavation equipment.

The first phase would involve removal of soil in the vadose zone. It is expected that approximately one-half of the total amount of soil to be removed would be unsaturated.

The second phase would involve removal of soil in the saturated zone. Wastewater piping within the excavated area would be removed. Groundwater accumulating in the excavation would be pumped out, treated using a portable treatment system containing ion exchangers and filters, and discharged to Erdman Brook through an SPDES-permitted outfall.

Figure 7-11 shows the planned depth of excavation. The excavation would extend at least one foot into the Lavery till and one foot below the sediment in the bottoms of Lagoons 2 and 3 as indicated in the figure, with the amount of additional soil removal determined by the use of cleanup goals specified in Section 5.[8] Remedial action surveys would be performed during the course of the work and soil on the bottom and sides of the excavation with radioactivity concentrations exceeding the cleanup goals would be removed. Soil with radioactivity concentration exceeding cleanup goals would be excavated as close to the hydraulic barrier as practicable. However, the lateral extent of the remediation would not exceed the boundary shown in Figure 7-10 during Phase 1.

Lagoon 1

Lagoon 1 during operation was approximately 82 feet by 82 feet by five feet deep. It now contains radioactively contaminated sediment, asphalt, soil and vegetation and is capped with clay and covered with topsoil.

Sheet piles would be installed around Lagoon 1 as necessary to control groundwater flow into the area to be excavated. The excavation would be dug to encompass an area roughly 100 feet by 100 feet and extend approximately two feet into the Lavery till, with a total depth of approximately 14 feet. The clay cap, hardstand waste, and contaminated sand and gravel underlying Lagoon 1 would be excavated, along with the underlying sediment. The excavation would extend at least one foot into the underlying Lavery till, with the cleanup goals specified in Section 5 being used to determine the need for any additional soil removal. Phase 1 final status surveys would be performed in the excavated area and arrangements would be made for independent confirmatory surveys before the excavation is filled in, as described below. (These surveys would be performed when the entire WMA 2 excavation has been completed.)

Lagoon 2

As indicated previously, Lagoon 2 is an unlined basin approximately 280 feet long, 195 feet wide, and 17 feet deep with a significant amount of radioactive contamination in the bottom sediment.

Water in the lagoon would be treated in the LLW2 Facility and discharged though an SPDES-permitted outfall into Erdman Brook. Auxiliary equipment such as piping in the pump shed and the shed itself would be removed. Contaminated lagoon sediment would be removed along with at least one foot of underlying Lavery till, with the cleanup goals specified in Section 5 being used to determine the extent of any additional soil removal. As with Lagoon 1, Phase 1 final status surveys would be performed in the excavated area and arrangements would be made for independent confirmatory surveys before the excavation is filled in, as described below.

Lagoon 3

As indicated previously, Lagoon 3 is an unlined basin similar in design to Lagoon 2, but 24 feet deep rather than 17 feet deep, with low level radioactivity in the sediment. It would be decommissioned using the same process as Lagoon 2.

Solvent Dike

Radioactively contaminated soil in the Solvent Dike area would be removed before the large excavation is dug. This sequence would facilitate management of any unexpected wastes that might be present.

[8] Note that Figure 7-11 shows the interface between the sand and gravel unit and the Lavery till in the area of Lagoon 1; Lagoon 2 and Lagoon 3 extend well into the Lavery till.

Other Parts of the Excavation

Removal of soil in between the facilities in the area to be excavated would be coordinated with excavation of the facilities themselves so that the entire area is excavated as indicated in Figures 7-10 and 7-11, with the excavation extending at least one foot into the Lavery till. Any sheet piles installed to facilitate excavation of Lagoon 1 would be removed after that lagoon is excavated,

Surveying and Backfilling the Excavation

Phase 1 final status surveys would be performed in the bottom and sides of the excavation to verify that the cleanup goals have been achieved and arrangements made for independent confirmatory surveys. After these surveys are completed and any issues resolved, the excavation would be filled with uncontaminated earthen backfill and the surface leveled with the surrounding area. The backfill material would be obtained from similar offsite geologic deposits. The properties of this material would be similar to the backfill used in the WMA 1 excavation.

Lagoons 4 and 5

Lagoons 4 and 5 are similar above-grade lagoons that were constructed in 1971 from till material. Lagoon 4 has a capacity of 204,000 gallons and Lagoon 5 has a capacity of 166,000 gallons. Both are now lined with concrete grout and geomembranes. Low levels of radioactive contamination are expected in sediment both above and below the lagoon liners.

The geomembranes and the concrete and clay liners in Lagoons 4 and 5 would be removed and underlying soil excavated to a maximum depth of two feet. After completion of this work, a Phase 1 final status survey would be performed in the area, and arrangements made for any independent verification surveys described by the regulators. The excavated area would be filled with clean earth after the surveys.

Appendix D addresses monitoring and maintenance of the WMA 2 area between the completion of Phase 1 of the proposed decommissioning and the beginning of Phase 2. Appendix D also provides information on expected changes to the groundwater flow field that would occur with completion of the Phase 1 proposed decommissioning activities in WMA 2.

7.5 WMA 3 Proposed Decommissioning Activities

This section addresses proposed decommissioning activities in the Waste Tank Farm area, which include removal of two structures, piping and equipment in the HLW transfer trench, and the mobilization and transfer pumps in the underground waste tanks, along with requirements for continuing maintenance of the underground waste tanks. WMA 3 is shown in Figure 3-29.

7.5.1 Removing Structures

The Con-Ed Building and the Equipment Shelter and Condensers would be removed with appropriate radiological controls and the resulting demolition debris characterized and disposed of at an appropriate offsite disposal facility.

Con-Ed Building

This small concrete block building located over the Tank 8D-3/8D-4 vault would be removed by removing the installed equipment, demolishing the structure to grade level, and performing Phase 1 final status surveys in the area of the building footprint.

Equipment Shelter

This concrete-block building – which is approximately 40 feet long, 18 feet wide, and 12 feet high – would be removed using a process similar to that used for the Con-Ed Building. The condensers would also be removed and disposed of at an offsite waste disposal facility. Soil in the footprints of the building and condenser foundations would be removed to a maximum depth of two feet below grade. Phase 1 final status surveys would be performed in the excavated areas and arrangements made for any independent confirmatory surveys to be performed. Afterwards, the excavated areas would be filled with clean earthen backfill.

7.5.2 Removing Waste Tank Pumps and Pump Support Structures

As noted previously, Tank 8D-1 contains five HLW mobilization pumps and Tank 8D-2 contains four of these centrifugal pumps. Tanks 8D-1 and 8D-2 also each contain a HLW transfer pump. Each pump has an overall length of more than 50 feet and contains significant amounts of radioactive contamination. Figure 3-32 shows both pump designs. Figure 3-34 shows a typical pump pit. As noted in Section 3, Tanks 8D-1 and 8D-2 each contain another suction pump and Tanks 8D-3 and 8D-4 are each expected to contain a small submersible pump.

The HLW mobilization and transfer pumps have been impacted by liquid HLW. DOE would follow applicable provisions of DOE Manual 435.1-1, *Radioactive Waste Management Manual*, concerning these pumps.

The HLW mobilization pumps, transfer pumps, and suction pumps would be removed and disposed of offsite using a process such as the following:

- Preparations would be made for handling the removed pumps in a controlled manner consistent with their expected high radiation and contamination levels and the expected waste classification of different parts of the pump assembly;
- Each pump would be removed using appropriate radiological controls, decontaminated as necessary, cut into sections during removal, and packaged for disposal;
- The pump support structures would be removed in conjunction with removal of the pumps; and
- The pump segments and the support structures would be disposed of offsite at appropriate waste disposal facilities.

The submersible pumps in Tanks 8D-3 and 8D-4 would also be removed using appropriate radiological controls and disposed of offsite as radioactive waste.

7.5.3 Removing HLW Transfer Trench Piping and Equipment

As noted previously, the HLW transfer trench, which is shown in Figure 3-33, is approximately 500 feet long, extending from the Tank 8D-3/8D-4 vault to the Vitrification Facility. The trench contains lines comprising approximately 3000 linear feet of double-walled stainless steel pipe. Each pump pit contains a waste transfer pump (which would be removed as specified in Section 7.5.2), discharge piping, and flow monitoring equipment; Pump Pit 8Q-2 also contains grinding equipment that was used to size reduce contaminated zeolite. The inner piping, valves, and the other equipment are expected to contain significant radioactive contamination.

The piping that was actually used and some of the other equipment were wetted by liquid HLW. DOE would follow applicable provisions of DOE Manual 435.1-1, *Radioactive Waste Management Manual* concerning the piping and such other equipment.

The piping and other equipment would be removed and disposed of offsite using a process such as the following:

- Preparations would be made for handling the removed piping and other equipment in a controlled manner consistent with their expected high radiation and contamination levels;
- The piping would be cut into sections and packaged for disposal;
- The other equipment would be removed, segmented as necessary, and packaged for disposal, with this effort coordinated with removal of the piping and waste mobilization and transfer pumps; and
- The piping and other equipment would be disposed of offsite at an appropriate waste disposal facility.

After the piping has been removed, Phase 1 final status surveys would be performed in the empty transfer trench and the trench covers reinstalled.

7.5.4 Monitoring and Maintenance

Monitoring and maintenance of the Waste Tank Farm would continue during the Phase 1 proposed decommissioning and until such time that Phase 2 of the proposed decommissioning begins. The tank and vault drying system installed during the work to establish the interim end state described in Section 3 would remain in operation.

The existing dewatering well would continue to be used to artificially lower the water table to minimize in-leakage of groundwater into the tank vaults. After the Low-Level Waste Treatment Facility is taken out of operation, the water from this well would be collected, sampled, treated if necessary using a portable wastewater treatment system, and released to Erdman Brook through a SPDES-permitted outfall.

Appendix D provides additional information on these matters.

7.6 WMA 5 Proposed Decommissioning Activities

This section addresses removal of Lag Storage Addition 4, the Remote-Handled Waste Facility, and remaining concrete floor slabs and foundations and gravel pads in WMA 5, the Waste Storage Area. Figure 3-35 shows this area.

7.6.1 Removing Lag Storage Addition 4 and the Shipping Depot

Lag Storage Addition 4, a clear-span structure with a pre-engineered frame and steel sheathing, is approximately 291 feet long, 88 feet wide, and 40 feet high. The attached steel framed, steel sided structure houses the Shipping Depot and Container Sorting and Packaging Facility.

These structures would be removed and the demolition debris disposed of at an appropriate off-site waste disposal facility using a process such as the following:

- Demolishing the structure to grade level;
- Removing the floor slab and excavating the building footprint to approximately two feet below grade;
- Disposing of the demolition debris at appropriate offsite waste disposal facilities;
- Performing Phase 1 final status surveys in the area excavated;
- Making arrangements for any independent confirmatory surveys to be performed in the excavated area; and
- After completion of the surveys, filling in the excavated area with clean earthen backfill.

7.6.2 Removing the Remote-Handled Waste Facility

This metal-sided, steel-frame building, which became operational in 2004, includes a receiving area, a buffer cell, a work cell, a waste packaging area, an operating aisle, and a load-out/truck bay. It is shown in Figures 3-36 and 3-37.

This facility is used to remotely section and package high-activity equipment and waste and is permitted as a mixed waste treatment and storage containment building. The closure of the facility under an approved Resource Conservation and Recovery Act closure plan would be coordinated with the demolition under this plan.

The Remote-Handled Waste Facility would be removed using a process such as the following:

- Removing the installed equipment such as the cranes and tanks;
- Demolishing the structure to grade level;
- Removing the floor slab and foundation, removing the below-grade part of the structure, and excavating the rest of the building footprint to approximately two feet below grade;
- Disposing of the demolition debris at appropriate offsite waste disposal facilities;
- Performing Phase 1 final status surveys in the area excavated;
- Making arrangements for any independent confirmatory surveys to be performed in the excavated area; and
- After completion of the surveys, filling in the excavated area with clean earthen backfill.

The underground decontamination waste transfer lines from the Batch Transfer Tank in the building to Tank 8D-3 in WMA 3 would be removed and disposed of as LLW if they have been exposed to radioactivity; otherwise, they would remain in place.

7.6.3 Removing Remaining Floor Slabs and Foundations and Gravel Pads

All remaining concrete floor slabs and foundations would be removed, including those associated with the Lag Storage Building, Lag Storage Addition 1, and Lag Storage Addition 3. The Lag Storage Addition 2 hardstand would also be removed, along with the gravel pads associated with the Chemical Process Cell Waste Storage Area, the hazardous waste storage lockers, the cold hardstand area, the vitrification vault and empty container hardstand, the old/new hardstand storage area, the lag hardstand, and the Product Purification Cell box storage area.

The remaining floor slabs, foundations, and gravel pads would be removed along with the underlying soil to approximately two feet below grade, with the debris and removed soil disposed of at appropriate offsite waste disposal facilities. This work would be followed by Phase 1 final status surveys of the excavated areas and any independent verification surveys desired by the regulators. After the surveys have been completed, the excavations would be filled with earth.

7.7 WMA 6 Proposed Decommissioning Activities

This section addresses proposed decommissioning activities in WMA 6, the Central Project Premises, which is shown in Figure 3-38. These activities involve removal of the Sewage Treatment Plant, the south Waste Tank Farm Test Tower, the two demineralizer sludge ponds, the equalization basin, and the equalization tank. The demolition debris and the removed soil would be disposed of at appropriate offsite disposal facilities.

7.7.1 Removing the Sewage Treatment Plant

This wood frame structure with metal siding and roofing was used to treat sanitary waste and contains six in-ground concrete tanks, one above-ground polyethylene tank, and one above-ground stainless steel tank. This facility would be completely removed, including the underground concrete tanks, with the concrete foundation and underlying soil removed approximately two feet below grade.

After completion of this work, a Phase 1 final status survey would be performed in the excavated area and arrangements made for any independent verification surveys requested by the regulators. Experience with buildup of natural and manmade radioactivity in sewage sludge (ISCORS 2005) would be taken into account in these surveys. After completion of the surveys, the excavated area would be filled with earth.

7.7.2 Removing the Equalization Basin

The equalization basin is an earthen basin lined with Hypalon® approximately 50 feet by 125 feet by seven feet deep that has served as a replacement for the demineralizer sludge ponds.

The liner and approximately two feet of underlying soil would be removed and disposed of offsite. After completion of this work, a Phase 1 final status survey would be performed in the area and arrangements made for any independent verification surveys requested by the regulators. After completion of the surveys, the area would be filled with earth.

7.7.3 Removing the Equalization Tank

The Equalization Tank is a 20,000-gallon underground concrete tank immediately north of the Equalization Basin that serves as a replacement for the Equalization Basin.

The tank would be demolished and approximately two feet of underlying soil removed, with this material disposed of offsite. After completion of this work, a Phase 1 final status survey would be performed in the area and arrangements made for any independent verification surveys requested by the regulators. After completion of the surveys, the area would be filled with earth.

7.7.4 Removing the Demineralizer Sludge Ponds

The north and south demineralizer sludge ponds are separate, unlined basins excavated in the sand and gravel layer that are known to contain low-level radioactive contamination.

The area of the ponds would be excavated to a total depth of approximately five feet, with the material removed being disposed of offsite at an appropriate waste disposal facility. After completion of this work, a Phase 1 final status survey would be performed in the area and arrangements made for any independent verification surveys requested by the regulators. After completion of the surveys, the area would be filled with earth.

7.7.5 Removing the South Waste Tank Farm Test Tower

This test tower would be removed, including its concrete foundation and underlying soil to approximately two feet below grade, with the debris and soil disposed of offsite. After completion of this work, a Phase 1 final status survey would be performed in the area and arrangements made for any independent verification surveys requested by the regulators. After completion of the surveys, the area would be filled with earth.

7.7.6 Removing the Remaining Floor Slabs and Foundations

The remaining floor slabs and foundations in the area – including the underground structure of the Cooling Tower– would be removed, with underlying soil removed to a maximum depth of two feet below grade. After completion of this work, a Phase 1 final status survey would be performed in the area and arrangements made for any independent verification surveys requested by the regulators. After completion of the surveys, the area would be filled with earth.

7.8 WMA 7 Proposed Decommissioning Activities

WMA 7, the NDA area, is shown in Figure 3-41. The NDA would continue to be monitored and maintained during Phase 1 and no decommissioning actions related to the NDA itself would take place in this phase of the proposed decommissioning. The only Phase 1 proposed decommissioning actions would involve removal of the remaining concrete slabs and gravel pads associated with the NDA hardstand.

These concrete slabs and gravel pads would be removed and the footprints of these areas would be excavated to a maximum of depth two feet below grade, with the debris and excavated materials disposed of offsite. Phase 1 final status surveys would be performed in the excavated areas and arrangements made for any independent verification surveys requested by the regulators. After completion of the surveys, these areas would be filled with earth.

7.9 WMA 9 Proposed Decommissioning Activities

This section describes proposed decommissioning activities in the Integrated Radwaste Treatment System Drum Cell area, which is shown in Figure 3-42. Phase 1 proposed decommissioning activities in this area would involve removal of the Drum Cell, the trench soil container area, and the subcontractor maintenance area.

The Drum Cell is a pre-engineered metal building 375 feet long, 60 feet wide, and 26 feet high, with concrete shield walls, remote waste handling equipment, container storage areas, and a control room. It would be demolished by conventional means and the floor slab, gravel pad, and foundation removed, along with underlying soil to at least two feet below grade. After completion of this work, a Phase 1 final status survey would be performed in the excavated area and arrangements made for any independent verification surveys requested by the regulators. After completion of the surveys, the excavated area would be filled with clean earth.

The trench soil container area is located northwest of the Drum Cell. The material in this area would be removed and its footprint excavated to a maximum depth of approximately two feet below grade, with the excavated materials disposed of offsite. Phase 1 final status surveys would be performed in the excavated area and arrangements made for any independent verification surveys requested by the regulators. After completion of the surveys, the area would be filled with clean earth.

The subcontractor maintenance area, a gravel pad near the rail spur, would be removed using the process used for the trench soil container area.

7.10 WMA 10 Proposed Decommissioning Activities

The Phase 1 proposed decommissioning activities in this WMA, the support and services area, would consist of removing the New Warehouse and the remaining concrete floor slabs and foundations, along with the former Waste Management Storage Area. WMA 10 is shown in Figure 3-43.

The New Warehouse would be removed. This structure is 80 feet wide, 250 feet long, and 21.5 feet high and rests on concrete piers and a poured concrete foundation wall. It would be demolished by conventional means and its foundation and the underlying soil removed to a maximum depth of approximately two feet below grade. After completion of this work, a Phase 1 final status survey would be performed in the excavated area and arrangements made for any independent verification surveys requested by the regulators. After completion of the surveys, the excavated area would be filled with clean earth.

The remaining floor slabs and foundations in the area – including those for the Administration Building, the Expanded Environmental Laboratory, and the Fabrication Shop – would also be removed, with underlying soil removed to a maximum depth of approximately two feet below grade. The former Waste Management Storage Area would also be removed in the same manner. After completion of this work, a Phase 1 final status survey would be performed in each excavated area and arrangements made for any independent verification surveys requested by the regulators. After completion of the surveys, the excavated areas would be filled with earth.

The Meteorological Tower and the Security Gatehouse and fences would remain in place.

7.11 Remedial Technologies

A combination of conventional technologies and proven innovative technologies would be used to accomplish the proposed decommissioning activities specified in the preceding sections. This section summarizes these technologies in the following categories:

- Pipe cutting and other metal cutting,
- Tool positioning,
- Concrete cutting and demolition,
- Concrete decontamination,

- Demolition of structures, and
- Excavation and grading

It is not the intention of this summary of remediation technologies to preclude the use of other, better technologies that may be developed, so long as they are comparable with and equivalent to those discussed here, nor is it DOE's intention to endorse the products of particular manufacturers beyond observations about cases where those products have been successfully used. More specific information on the technologies to be used would be provided in the Decommissioning Work Plan(s).

7.11.1 Pipe Cutting and Other Metal Cutting

The following methods would be used as applicable for cutting radioactively contaminated piping and metal liners, equipment, and structural components. Methods would be selected based on efficiency and suitability for the particular applications, with consideration of factors such as personnel safety, metal thickness, and radioactive contamination control. These technologies are listed in alphabetical order.

Diamond Wire Cutting Systems

This technology is suitable for cutting thick steel plate such as that which may be used in the shielded transfer cell in the Load-In/Load Out Building. It is described below under Concrete Cutting and Demolition.

Duriron Pipe Cutting

Because Duriron is hard and brittle, Duriron wastewater piping is typically cut into sections using either a chain-type tool or a special tool provided by the piping manufacturer to score the pipe, and tapping it with a mallet to fracture it at the score mark.

Hand-Held Shear

This technology, manufactured by Res-Q-Tek, Inc., cuts stainless-steel pipes up to 1.5 inches in diameter, and has been used at DOE's Fernald site. This shear can also crimp pipes to minimize potential spillage of pipe contents.

High-Speed Clamshell Pipe Cutter

This technology can cut through large pipes up to 24 inches in diameter with minimal clearance requirements. This equipment is manufactured by Tri-Tool, Inc., and has been used at DOE's Hanford site.

Mega-Tech Hydraulic Shears

This equipment, manufactured by Mega-Tech, Inc., can be used to cut stainless steel pipes up to 1.5 inches in diameter and has been used at Argonne National Laboratory.

Nd:YAG Laser

A Lumonics two kilowatt neodymium-doped yttrium aluminum garnet (Nd:YAG) laser has been used to remotely size reduce about 300 fuel storage tubes and radioactively-contaminated converter shells from the former K-25 Gaseous Diffusion Plant site at Oak Ridge, Tennessee.

Nibblers

Electric nibblers have been found effective in cutting sheet metal in many applications. They are readily available commercially.

Pipe Cutting and Crimping System

The Burndy Lightweight Portable Crimper is an electrically powered hydraulic crimping tool that cuts smaller-diameter piping by crimping and minimizes the potential spillage of piping contents. This equipment is manufactured by Burndy, Inc, and has been used at DOE's Mound facility.

Pipe Cutting and Isolation System

This robotic technology developed by TPG Applied Technology consists of three tools: a pipe-cutting tool, a pipe-cleaning tool, and a pipe-plugging tool. This system has been used to cut pipes within storage tanks at the K-25 Plant at DOE's Oak Ridge site.

Powered Pipe Cutting Machines

Air-powered pipe cutoff machines have been found effective by the U.S. Navy in cutting stainless steel piping of varying diameters.

Reciprocating Saws and Portable Band Saws

Variable-speed electric reciprocating saws and portable band saws were found effective in cutting stainless steel piping and other metal shapes up to one-half inch thick during the decommissioning of the Barnwell Nuclear Fuel Plant. Effectiveness depends on blade type, cutting speed, and blade lubricant.

Roller Cutters

Manually operated roller cutters have been found effective by the U.S. Navy on highly-contaminated, smaller diameter piping where radiological containment is required.

Size Reduction Machine

The Mega-Tech Services size reduction machine has been used at DOE's Savannah River Site and is capable of hydraulically shearing piping from six feet below floor level to 15 feet above floor level. It can shear pipes up to four inches in diameter

Thermal Cutting Technologies

Oxy-acetylene and oxy-gasoline cutting torches have been used to cut steel pipe and plate at DOE sites. The oxy-gasoline cutting torch is specially suited for cutting carbon-steel pipes and plates, and can cut steel up to 4.5-inch in thickness at a rate three times faster than oxy-acetylene cutting. This equipment is manufactured by Petrogen International, and has been used at DOE's Oak Ridge, Fernald, and Mound sites.

7.11.2 Tool Positioning Technologies

The following three systems have been found to be useful at DOE sites:

Dual Arm Work Platform

The dual arm work platform is a remotely operated deployment platform that uses a variety of equipment to dismantle metal assemblies. Two Schilling Titan III manipulator arms provide six degrees of freedom, and are powered by a 3000 psi hydraulic system.

Each arm is capable of lifting 240 pounds, while the grippers on the end of the arms can exert 1,000 lbs of crushing force. The platform is designed to be free standing or suspended from an overhead crane. This system was used at the DOE CP-5 Research Reactor Large-Scale Demonstration Project at Argonne National Laboratory – East.

Mobile Work Platform

The Mobile Work Platform is a remote-controlled machine designed to remove pipe/conduit. A rotating turret is equipped with a folding main boom and a telescoping job boom capable of reaching 27 feet. The boom system can lift over four tons with the outriggers in place. With the dual crimper/shear attached to the jib boom, the reach extends out to 32 feet above the ground.

Rosie - Mobile Work Platform

Rosie evolved from the Remote Work Vehicle that supported cleanup work at the Three Mile Island nuclear power plant. The Rosie is a remotely operated, mobile work platform built by RedZone Robotics. It is a four-wheel drive, four-wheel steer locomotor that is capable of deploying tools weighing up to 2,000 lbs to a height of 27 ft with a telescoping boom with various end effectors.

A control console allows a single operator to remotely manipulate Rosie using video and data displays. Video displays are provided by up to ten cameras mounted on Rosie, in addition to cameras mounted in the facility. During the demonstration at the CP-5 Research Reactor, Rosie was fitted with a jackhammer and used to remove high-density concrete from the reactor's upper shield plug.

7.11.3 Concrete Cutting and Demolition

Concrete Saws

Concrete saws such as those used during highway pavement maintenance have been used effectively in cutting out sections of concrete floors during nuclear facility decommissioning. They are available from various manufacturers with carbide and diamond-impregnated saw blades ranging up to 30 or more inches in diameter.

Remote Controlled Demolition Machines

Demolition machines have been used to remotely remove and size-reduce concrete, piping, and structural steel. The Brokk remote controlled demolition machines, such as the model shown in Figure 7-12, are manufactured by Holmhed Systems AB. They can be operated remotely with a hydraulic hammer, excavating bucket, concrete crusher, and a shear. The arm has a reach of 15 feet, and can be operated remotely at distances up to 400 feet.

One was used effectively in dismantling equipment in the Vitrification Cell during cell deactivation. These machines could be used in various places in the Process Building and Vitrification Facility.

Figure 7-12 Typical Demolition Machine

Diamond Wire Cutting Systems

Diamond wire cutting utilizes diamond-impregnated wire to cut metal and concrete. The system uses a series of guide pulleys to draw the continuous wire strand through the cut. This technology has been used at numerous decommissioning projects, such as Fort St. Vrain, DOE's C Reactor Interim Safe Storage Project at the Hanford site (Trentec, Inc., Cincinnati, Ohio), and the Tokamak Fusion Test Vessel (Bluegrass Bit Co., Greenville, Alabama).

Diamond wire cuts through reinforced concrete, rebar, structural steel, and steel plate without generating large amounts of dust. The wire is cooled with either water collected in a sump, which controls any loose contamination generated during cutting, or with liquid nitrogen in situations where waste generation is a prime concern.

Jackhammers and Chipping Hammers

Pneumatic jackhammers and chipping hammers have been used on many projects to break up contaminated concrete by creating localized fractures with repeated blows. They are available from numerous manufacturers.

7.11.4 Concrete Decontamination

Contaminated concrete surfaces would be decontaminated using conventional means such as vacuuming and wiping with cloths dampened with water or non-hazardous decontamination agents. The following technologies would also be considered and used as appropriate:

Concrete Shaver

Marcrist Industries and Demolition Technologies manufacture manned and remote concrete shavers that remove surface concrete from flat and curved surfaces. The diamond-impregnated shaving blades are ten to 12 inches wide, and each pass of the shaver can remove up to one-quarter inch of concrete at a rate of 128 square feet per hour. The Marcrist DTF-25 can shave floors to depths of 0.5 inches. Dust is contained within a HEPA-filtered vacuum system. Manned equipment has been used at the Hanford C Reactor and the remote-controlled equipment has been used at the Rancho Seco Nuclear Plant.

Concrete Spaller

This hand-held tool is used to decontaminate flat concrete walls and floors by removing concrete pieces ranging from seven to 16 inches in diameter by hydraulically expanding within pre-drilled holes. A shroud collects the pieces of concrete, while a HEPA filter controls the potential release of airborne materials. The spaller removes concrete faster, to a greater depth and at a lower cost per square foot than traditional baseline scabblers and scalers when removing to a depth of one-eighth inch or greater. Pacific Northwest National Laboratory is a manufacturer of spallers.

Centrifugal Shot Blast System

Concrete Cleaning, Inc. and Pentek manufacture manned and remotely operated centrifugal shot blast scabbling systems that use hardened steel shot at high velocities to remove the outer surface area of concrete. The concrete fragments are captured by an integrated vacuum system. This technology is used in confined space situations and for shallow depths of contamination (less than one inch).

The MOOSE®, a remotely operated floor scabbling centrifugal shot blasting system from Pentek, is capable of effectively removing concrete to a depth of 3/16 of an inch and has removed concrete to a depth of one inch with some difficulty (Figure 7-13). The technology was successfully demonstrated at DOE's Fernald facility.

Remote Dry-Ice Blasting System

The ROVCO 2 system integrates two demonstrated technologies: a remotely operated vehicle and a dry-ice (CO_2) blasting system. The vehicle transports and powers the vehicle-mounted subsystems, including the CO_2 XY orthogonal end effector (COYOTEE), cryogenesis dry-ice blasting system, and the vacuum/filtration/containment subsystems. The COYOTEE manipulates a specially designed vacuum containment workhead with the cryogenesis blasting nozzle to cover every point within a rectangular workspace. Since ROVCO 2 utilizes CO_2 gas, it has the potential to eliminate process waste resulting from the blasting material.

Figure 7-13. MOOSE®

Rotary Drum Planer

The rotary drum planer is widely used to remove concrete in highways and parking lots. This technology consists of a drum with replaceable tungsten-carbide teeth. The planer is attached to a

Bobcat loader and cuts a 16-inch swath up to six inches deep, providing that there is no wire or rebar present within the concrete because this metal would break the cutting teeth.

The system can be customized to be dust free by simultaneously drumming the waste with a vacuum shroud. This baseline technology has been used at numerous DOE facilities, including Fernald.

Scabblers

This manual or remote technology utilizes a series of tungsten carbide-tipped bits mounted on a hammer head that pulverize the concrete surface via mechanical impacts. The dust and debris removed from contaminated concrete surfaces are then captured by a HEPA-filtered vacuum system. This technology is suitable for removing contaminated concrete from large areas, but is less successful in corners and in concrete seams and cracks. Scabblers have been used on many decommissioning projects, including those at the Argonne National Laboratory and the Idaho National Engineering and Environmental Laboratory.

Soft Media Blast Cleaning

Soft Media Blast Cleaning uses a pneumatically propelled soft media to remove surface contaminants. The soft blast media impacts the surface with high energy, absorbing the contaminants and carrying them away from the substrate for easy disposal. This system is used for low levels of surface contamination.

Steam Vacuum Cleaning

The Kelly Decon System uses a pressurized (250 psi) superheated (up to 300°F) water stream to remove contamination from surfaces. Several of the cleaning heads integrate a vacuum hood and return line which captures and controls the steam, water droplets, and dislodged contaminants generated when the water spray impacts on the surface being cleaned. The primary application for the Kelly System has been the surface decontamination of rooms, pools, walls, large components, or similar applications related to large and/or smooth surfaces.

Robotic Hammer

This robotic jackhammering system, manufactured by Bluegrass Bit Co. of Greenville, Alabama, has been used where jack hammering is preferred, but where radiation levels preclude manned operation.

Remote-Controlled Brokk Concrete Demolition Systems

As indicated above, Brokk demolition machines such as the BM 330 model pictured in Figure 7-12, can be used effectively in concrete demolition where radiological conditions make use of remote-controlled equipment preferable.

7.11.5 Demolition of Structures

Structures would be demolished using conventional methods and proven, advanced technologies such as the following:

Backhoe Pulverizer

This machine uses air-powered or hydraulic jaws mounted on a backhoe to crush concrete and separate rebar.

Backhoe Ram

A track-mounted backhoe ram is typically used for demolition of thick concrete or cinder block. It uses a pneumatic or hydraulic moil or chisel point to deliver blows to the area of interest.

Bulldozer

Bulldozers would typically be used to push structure sections down with the blade and pull sections down using wire rope attached to the structure section.

Portable Concrete/Asphalt Crusher

The Eagle Crusher Company, Inc. manufactures a portable concrete/asphalt crusher for size-reducing concrete debris. This equipment is bulky and is setup outside and adjacent to structures. It is best suited for concrete with little or no radioactive contamination.

Track-Mounted Shear/Crusher

This hydraulic equipment (manufactured by Tiger Machine Company) is one of the baseline tools for breaking up concrete surfaces into pieces for disposal. It is effective in razing structures quickly. Criteria for using this equipment are generally the amount of surface area to be broken up and accessibility for large equipment, because the track mounted configuration limits maneuverability.

Universal Demolition Processor

This technology, made by several manufacturers (e.g., Tramac), is essentially three different technologies in one. By exchanging jaw sets, it can be a concrete pulverizer, concrete cracker (including rebar), or a shear capable of cutting thick steel plates. The universal demolition processor is attached to a standard track-mounted carrier. One benefit is that it reduces the amount of equipment on site, due to its multiple capabilities. This equipment has been used at DOE's Fernald facility and at other demolition sites (Figure 7-14)

7.11.6 Excavation and Grading

DOE would use conventional equipment to remove soil, equipment, and portions of concrete structures, such as tracked excavators. Backhoes and bulldozers would be used as needed. Similar equipment would be used for grading the site.

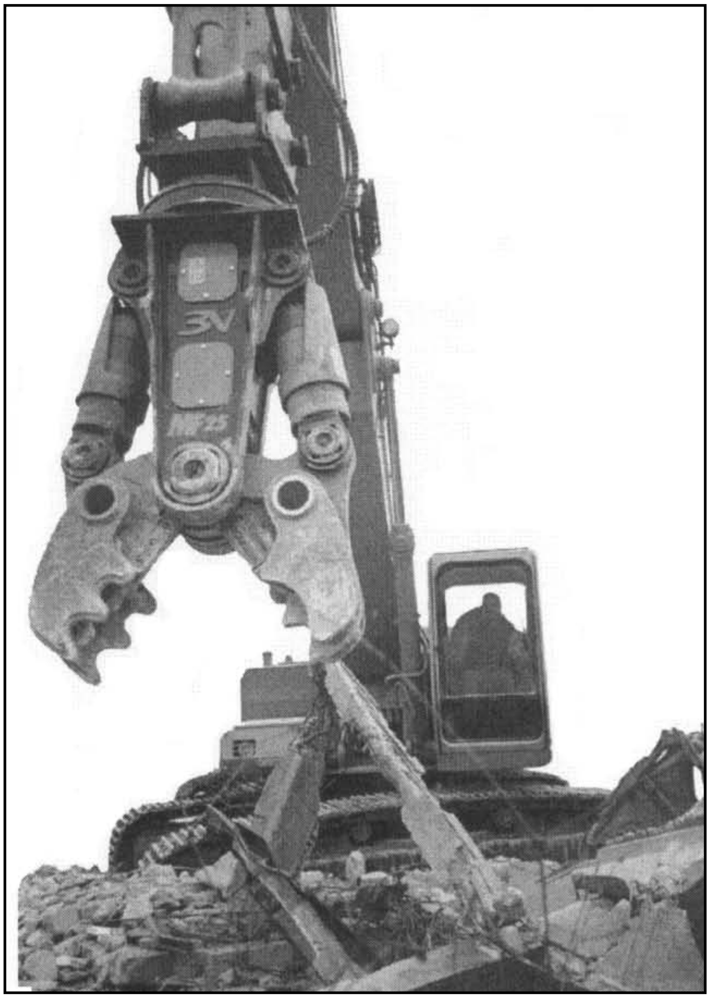


Figure 7-14. Universal Demolition Processor

7.12 Schedule

Due to the circumstances of the proposed decommissioning – such as the annual federal government funding process and the prerequisite of issuing the Record of Decision for the Decommissioning EIS – it is not practicable for DOE to provide a detailed schedule for the project at this time. Figure 7-15 provides a conceptual schedule for the project, with the basic sequence and order-of-magnitude time frames for major actions.

The dates on the schedule are contingent upon NRC approval of this plan. Before the proposed decommissioning begins, DOE would provide a more detailed schedule to NRC for information. DOE also recognizes that circumstances can change during the proposed decommissioning so that the proposed decommissioning could not be completed as outlined on the schedule. In such a case DOE would revise the schedule and provide the revised schedule to NRC.

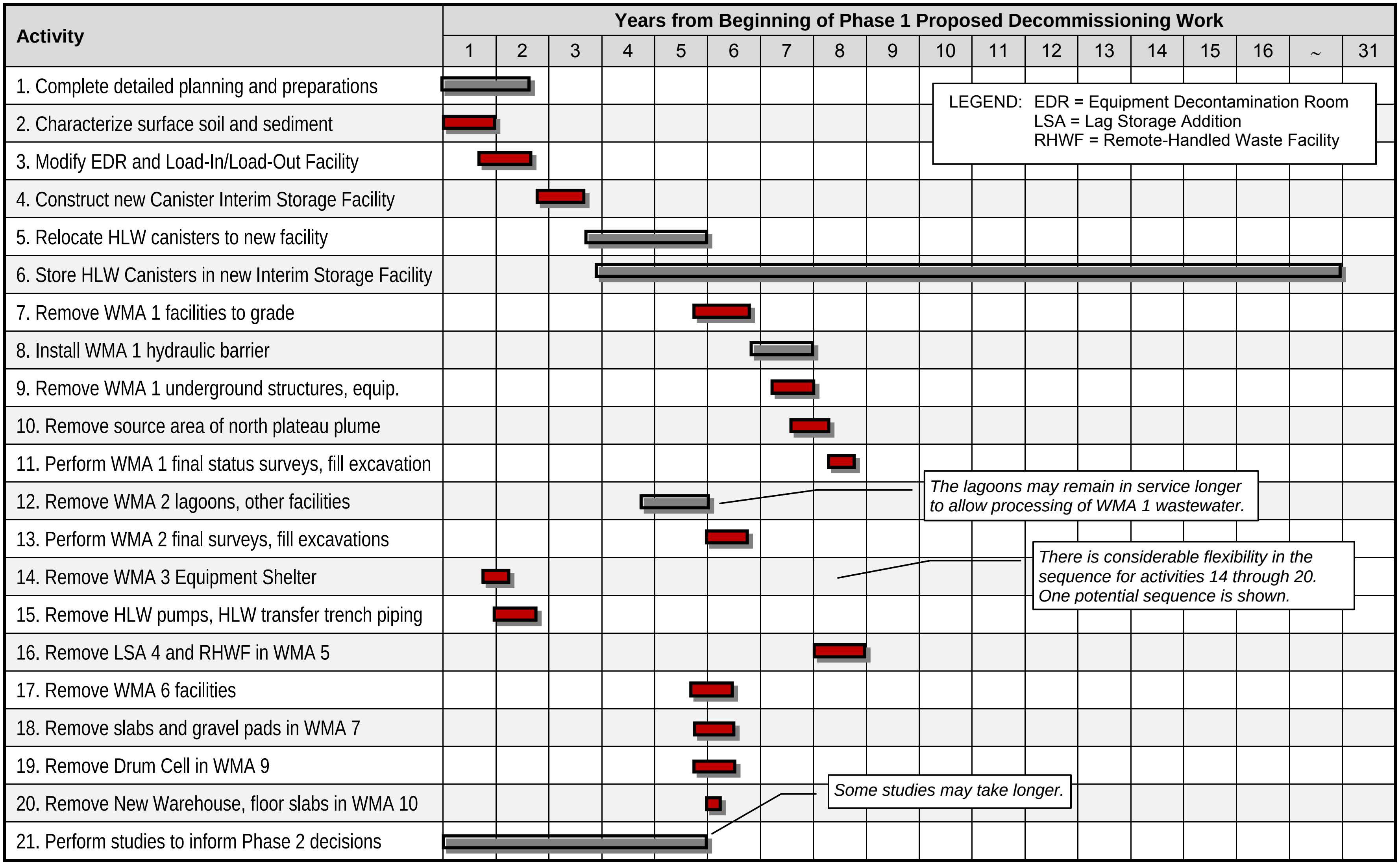


Figure 7-15. Conceptual Schedule of Phase 1 Proposed Decommissioning Activities

7.13 References

Code of Federal Regulations

40 CFR 61, *National Emission Standards for Hazardous Air Pollutants*

DOE Manuals

DOE Manual 435.1-1, Revision 1, *Radioactive Waste Management Manual*

Other References

EPA, 2007, *Clean Air Act Assessment Package, CAP88-PC, Version 3.0*. U.S. Environmental Protection Agency, Office of Radiation and Indoor Air, Washington, D.C., December 9, 2007.

Hemann and Steiner 1999, *1998 Geoprobe Investigation of the Core Area of the North Plateau Groundwater Plume*, WVDP-346, Revision 0. Hemann, M.R. and R.E. Steiner, III, West Valley Nuclear Services Company, June 11, 1999.

ISCORS 2005, *ISCORS Assessment of Radioactivity in Sewage Sludge: Modeling to Assess Radiation Doses*, Technical Report 2004-03 (NUREG-1783). Interagency Steering Committee on Radiation Standards, Sewage Sludge Subcommittee, Washington, D.C., February 2005.

NRC 1997, *Standard Review Plan for Dry Cask Storage Systems* NUREG-1536, Final Report. U.S. Nuclear Regulatory Commission, Washington, D.C., January 1997.

NRC 2000, *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*, NUREG-1575, Revision 1. NRC, Washington, DC, August, 2000. (Also EPA 4-2-R-97-016, Revision 1, U.S. Environmental Protection Agency and DOE-EH-0624, Revision 1, DOE)

WVNSCO 2006, *Safety Analysis Report for Waste Processing and Support Activities*, WVNS-SAR-001, Revision 11. West Valley Nuclear Services Company, West Valley, New York, November 11, 2006.

WVNSCO and Scientech, 2000, *High-Level Waste Canister Shipout from the West Valley Demonstration Project*, Revision 2. West Valley Nuclear Services Company, West Valley, New York and Scientech, Dunedin, Florida, June 30, 2000.